

JOURNAL *of the* American Veterinary Medical Association

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The American Veterinary Medical Association

CONTENTS

Editorials	287
Applications for Membership.....	291
Coming Veterinary Meetings.....	292
Report of the Thirty-sixth Annual Meeting of the United States Live Stock Sanitary Association:	
Address of the President—Peter Malcolm.....	293
The Trend of the Animal Industry in Mexico—Francisco Moguel M....	299
Symposium on Bang's Disease.....	309
Symposium on Meat and Milk Hygiene.....	345
Symposium on Miscellaneous Transmissible Diseases.....	376
Symposium on Tuberculosis.....	391
Symposium on Poultry Diseases.....	452
Symposium on Swine Diseases.....	492
Committee Reports	517
Election of Officers.....	526
Army Veterinary Service.....	540

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CURTAILING private incomes by usurping industrial and professional enterprises, and thereby building gigantic political power, of which the anti-scientific exploitation of disease-producing viruses is an example, is testing the patience of the American people and the solidity of a great republic.

THE CORN STATES SERUM CO.
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JOURNAL *of the* **American Veterinary Medical Association**

Formerly AMERICAN VETERINARY REVIEW

(Original Official Organ U. S. Vet. Med. Assn.)

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No. 3

LEGISLATION AND OTHER THINGS

Judging from the reports coming in from many parts of the country, state law-makers have started handing out some of the new deals promised in the political campaign of last fall. Also, as predicted by one prominent candidate for office, some of these new deals have very much the appearance of shuffles.

The legislature in Arkansas has enacted a law providing for the creation of a State Live Stock Sanitary Board to take the place of the Board of Control of the Agricultural Experiment Station in its supervision of live stock sanitary control work. The new body consists of five members, one of whom must be a graduate, licensed, practicing veterinarian. Dr. Rease Mitcham, of Little Rock, has been appointed the veterinary member of the Board and has been elected chairman. Dr. R. W. Williams, of El Dorado, also has been appointed a member of the Board, qualifying by being engaged in the live stock business, as specified in the new law. Dr. C. D. Stubbs, of Little Rock, has been appointed State Veterinarian. An examination of the new law indicates that the State of Arkansas will continue in the business of selling serums, vaccines and instruments.

On February 21, members of the Iowa House of Representatives displayed rare good judgment in defeating a proposal to amend the statute providing for compulsory tuberculin-testing

of cattle in Iowa, by a vote of 80 to 20. As chairman of the Legislative Committee of the Iowa Veterinary Medical Association, Dr. A. H. Quin, Jr., rendered yeoman service in marshalling forces against the bill. At a hearing on the bill, held February 8, Mr. Ray Murray, newly elected Secretary of Agriculture, promised to administer the existing law as economically as possible, by using the services of local veterinarians, subject to the approval of county boards of supervisors.

To show how varied were the interests appearing against the measure, all that is necessary is to name them. Besides Secretary Murray, the following spoke against the bill: Mr. Fred Larabee, president of the Iowa State Dairy Association; Dr. J. E. Dyson, child specialist of the Children's Home Society; Dr. Lee Hill, of the Polk County Medical Society; Mr. T. J. Edmonds, of the Des Moines Conference of Social Work; Mr. George Godfrey, of the State Board of Education; Dr. John Peck, president of the National Tuberculosis Association, and Dr. J. A. Barger, of the U. S. Bureau of Animal Industry.

Another bill has been introduced to liberalize the farmer-vaccination law of Iowa. Information is to the effect that the proposed law would do away with the schools of instruction which have been held in Iowa for quite a number of years. Farmers who attend these schools of instruction and pass a satisfactory examination receive permits to vaccinate their own hogs. If the proposed amendment is adopted, these schools will be discontinued and each farmer will be saved \$3.00, which is the present cost of a permit.

There is good reason to believe that there is a direct connection between the proposed legislation and an article, "Reducing the Cost of Vaccination," which appeared in the February 4 issue of a prominent farm paper, published in Des Moines, advocating the repeal of the Iowa serum-virus law. Among the statements made in the article were the following:

Hog cholera vaccination can be done by any farmer as well as the average veterinarian. . . . At present, we understand that there are 17,000 Iowa farmers holding vaccination permits, so that there are not many communities where one of these cannot be found who will be glad to give instruction in handling a syringe and keeping it clean and sterile. Illinois records show that fully 99 per cent of the farmers who do their own vaccinating get satisfactory results in every particular. We doubt that the veterinarians can show better results than that.

In any event the repealer was introduced in the Iowa Senate shortly after the publication of the article referred to. The author of this article, on at least one previous occasion, prominently displayed his ignorance of a purely veterinary matter,

and it is quite evident that he is just as uniformed on the subject of hog cholera as was the case with Bang's disease. It has been suggested that there may be some connection between a large display advertisement, which appeared in the issue of January 21, and the article which appeared in the issue of February 4. The advertisement announced that farmers could vaccinate their own pigs at a cost of less than 12 cents each. The serum company paying for this advertisement is one that caters largely, if not exclusively, to the farm trade.

One of the most startling statements made in the article is the reference to conditions in Illinois. If there is one thing in Illinois that Iowa would do well *not* to copy, it is the method—or lack of one—of handling the hog cholera situation. There is no control of hog cholera in Illinois. There is not even the faintest suggestion of any supervision of the sale, distribution or use of hog cholera virus. From what mysterious source the author of the article secured his information on the results of farmer vaccination is an open question. There are no comprehensive official records kept and those most interested in perpetuating an unsound practice do not want any. They might be embarrassing.

Just why a supposedly reputable publication should get behind a movement of this kind is difficult to understand. Should not a farm paper advocate policies that are in the interests of agriculture? Should not a farm paper urge sound methods for animal disease control? Iowa has made a large investment in one of the greatest veterinary colleges in America. There are 175 young men at Ames preparing to be veterinarians, and almost within the shadows of the institution we see the sorry spectacle of a powerful farm paper discouraging the employment of veterinary services. Does this paper really want to deprive Iowa of a competent veterinary service?

A bill designed to protect owners of live stock against the unscrupulous vendors of nostrums was introduced in the Indiana Senate in January. The bill had the endorsement of the Indiana Farm Bureau Federation and the Indiana Veterinary Medical Association. In effect the bill amends the Indiana Veterinary Practice Act. The Senate took favorable action on the bill on February 14, by a vote of 36 to 10. The House passed the bill on February 22, with an amendment, and returned it to the Senate for concurrence. The newspapers have quoted Indiana legislators with having made all sorts of comments on the probable effects of the bill if passed. One statement was to the effect that the bill was the signal for "a fight between

practicing veterinarians and manufacturers of live stock nostrums." Another was to the effect that the bill would make it easier to "control the incompetent and dishonest veterinarian." There was the time-honored suggestion that the bill would "create a monopoly for veterinarians." As returned to the Senate, the bill permits any farmer to vaccinate his own hogs or treat his own animals, and he may assist in the treatment of animals belonging to other persons as long as he receives no compensation for such services.

In Georgia a bill has been introduced, designed to abolish the office of State Veterinarian and to transfer all the duties, authority and power of this office to the Commissioner of Agriculture. An amendment to the bill provides for the appointment of a Chief State Veterinarian and six assistants. This legislation has every appearance of being a continuation of the fight that has been going on in Georgia between opposing factions for several years.

It is reported that a movement is on foot to abolish the Board of Agriculture in Missouri and that a bill has been introduced to abolish the Missouri State Board of Veterinary Examiners and put the examination and licensing of veterinarians in the hands of the State Veterinarian.

EXECUTIVE BOARD ELECTIONS

Two Executive Board elections are now in progress. These are being held in District 2 (Pennsylvania, New Jersey and Delaware) and in District 3 (Indiana, Illinois and Wisconsin). Ballots asking for nominations were mailed to all paid-up members in these two districts on February 14, which was six months before the opening date of the 1933 annual meeting. The polls for the primary elections will remain open for 60 days (until April 14) as provided in the By-laws.

OHIO VETERINARY CONFERENCE POSTPONED

Owing to the uncertainties of legislative appropriations in Ohio, it has been found necessary to postpone plans for the annual veterinary conference held at Ohio State University, according to a letter received from Dean O. V. Brumley. No funds are at present available and no new appropriations for the institution will be made until April, or possibly May. Failure to provide funds may make it necessary to omit the conference this

year. This is certainly to be regretted, as veterinarians of Ohio and adjoining states have come to look forward to this annual event as one of the high lights in veterinary educational circles in that part of the country. Let us hope that Dean Brumley will be able to find a way to hold a 1933 conference, even if a month or so late.

NEW STATE VETERINARIANS

Dr. N. O. Bevins (Iowa '11) has been appointed Chief of the Division of Animal Health, Iowa Department of Agriculture, succeeding Dr. Peter Malcolm (Ont. '90).

Dr. L. C. Crabb (K. C. V. C. '11) has been appointed Chief Veterinarian, Texas Live Stock Sanitary Commission, succeeding Dr. N. F. Williams (K. C. V. C. '11).

Dr. T. H. Ruth (Chi. '06) has been appointed Director of the Division of Animal Industry, South Dakota Department of Agriculture, succeeding Dr. R. S. Robinson (McK. '14).

APPLICATIONS FOR MEMBERSHIP

(See January, 1933, JOURNAL)

FIRST LISTING

CRAVENS, MARION L. 5547 S. California Ave., Chicago, Ill.
D. V. M., Iowa State College, 1920

Vouchers: H. H. Horn and Edward Himself.

HILLMAN, JOHN W. 20 Quincy St., North Adams, Mass.
V. M. D., University of Pennsylvania, 1932

Vouchers: H. W. Jakeman and Edmund M. Dowling.

PALS, CLARENCE H. 6401 University Ave., Chicago, Ill.
D. V. M., Iowa State College, 1932

Vouchers: H. B. Raffensperger and H. H. Horn.

Applications Pending

SECOND LISTING

(See February, 1933, JOURNAL)

Jaffray, John B., 2956 Washington Blvd., Chicago, Ill.

Kendall, Gordon C., 3-4 War Memorial Bldg., Nashville, Tenn.

McCune, Eugene F., 7401 S. Puget Sound Ave., Tacoma, Wash.

Nolan, James D., Box 912, Raymond, Wash.

Sweeney, Martin A., 6523 South Park Ave., Chicago, Ill.

The amount which should accompany an application filed this month is \$9.16, which covers membership fee and dues to January 1, 1934, including subscription to the JOURNAL.

COMING VETERINARY MEETINGS

- New York City, Veterinary Medical Association of. Academy of Medicine, 5th Ave. and 103rd St., New York, N. Y. March 1, 1933. Dr. John E. Crawford, Secretary, 708 Beach 19th St., Far Rockaway, Long Island, N. Y.
- San Diego-Imperial Veterinary Medical Association. San Diego, Calif. March 1, 1933. Dr. A. P. Immenschuh, Secretary, Santee, Calif.
- Southeastern Michigan Veterinary Medical Association. Detroit, Mich. March 8, 1933. Dr. A. S. Schlingman, Secretary, Parke, Davis & Co., Detroit, Mich.
- Tulsa County Veterinary Association. Tulsa, Okla. March 9, 1933. Dr. J. M. Higgins, Secretary, 3305 E. 11th St., Tulsa, Okla.
- East Tennessee Veterinary Medical Society. White Surgical Supply Co., Knoxville, Tenn. March 11, 1933. Dr. R. E. Baker, Secretary, Morristown, Tenn.
- Interstate Veterinary Medical Association. Elks Bldg., Omaha, Neb. March 13, 1933. Dr. G. L. Taylor, Secretary, Plattsmouth, Neb.
- Chicago Veterinary Medical Association. Hotel LaSalle, Chicago, Ill. March 14, 1933. Dr. O. Norling-Christensen, Secretary, 1904 W. North Ave., Chicago, Ill.
- Southern California Veterinary Medical Association. Chamber of Commerce Bldg., Los Angeles, Calif. March 15, 1933. Dr. E. E. Jones, Secretary, 1451 Mirasol St., Los Angeles, Calif.
- New Mexico Veterinary Medical Association. Albuquerque, N. M. March 17-18, 1933. Dr. F. H. Barr, Secretary, 112 S. Broadway, Albuquerque, N. M.
- Kansas City Veterinary Association. Baltimore Hotel, Kansas City, Mo. March 21, 1933. Dr. J. D. Ray, Secretary, 1103 E. 47th St., Kansas City, Mo.
- Keystone Veterinary Medical Association. Philadelphia, Pa. March 22, 1933. Dr. C. S. Rockwell, Secretary, 5225 Spruce St., Philadelphia, Pa.
- Southwestern Minnesota Veterinary Medical Association. New Ulm, Minn. April 6, 1933. Dr. E. R. Tillisch, Secretary, Westbrook, Minn.
- Maine Veterinary Medical Association. State House, Augusta, Me. April 12, 1933. Dr. L. E. Maddocks, Secretary, R. F. D. 2, Augusta, Me.
- American Veterinary Medical Association. Palmer House, Chicago, Ill. August 14-18, 1933. Dr. H. Preston Hoskins, Secretary, 1230 W. Washington, Blvd., Chicago, Ill.

Report of the Proceedings
of the
Thirty-sixth Annual Meeting
of the
United States Live Stock
Sanitary Association

Chicago, Illinois, November 30-December 2, 1932

WEDNESDAY MORNING, NOVEMBER 30, 1932

The opening session of the thirty-sixth annual meeting of the United States Live Stock Sanitary Association, held at the Hotel LaSalle, Chicago, Illinois, November 30-December 2, 1932, convened at 10.40 a. m., Dr. P. Malcolm, president of the Association, presiding.

PRESIDENT MALCOLM: We are somewhat late in starting, due to the fact that Dr. Fishbein is not here, but when he does arrive, we will have him on the program.

I am going to start with the President's address. If you will give me your attention, I shall endeavor to give you a few of my ideas regarding an association of this kind.

. . . President Malcolm read his address. . . .

THE ADDRESS OF THE PRESIDENT

By PETER MALCOLM, *Des Moines, Iowa*
Chief, Division of Animal Industry
Iowa Department of Agriculture

I appreciate the great honor you as members of the United States Live Stock Sanitary Association accorded me in electing me President, and again I wish to thank you for this honor.

At each annual meeting of this Association the President is supposed to make recommendations as to how to handle the many complicated problems that have to do with the controlling of transmissible diseases of live stock. Fully realizing that the live stock sanitary world is looking to this Association for guidance in all problems pertaining not only to live stock disease control but to disease control in the human family, and feeling that there is no one person endowed with sufficient knowledge to assume the responsibility of dictating recommendations to this Association (which is, as you know, made up of not only pro-

professionally trained men but men who have specialized in different branches of their profession and have made a study of the problems of disease control) I, therefore, refrain from making any scientific recommendations and will confine my remarks to things in general.

We are dealing with problems of live stock sanitation which is one of the all-important questions relating to the live stock industry not only of the United States but of the world. Few industries are of greater importance to the citizens of a country than the live stock industry. Therefore, it is essential that this industry be protected against the ravages of disease, and in particular contagious disease.

An enormous amount of money is invested in live stock; successful agriculture is more or less dependent on the successful raising of live stock; the security of investments in live stock depends very largely on its being protected against disease. Furthermore, the live stock industry produces a large amount of food for our people as well as clothing and other necessities of modern civilization.

It is incorrect to hold that the owners of live stock are the only persons who suffer from the ravages of live stock diseases. If the food supply is diminished, want, misery and death among mankind increase. It has been proven beyond any reasonable doubt that certain disease conditions frequently found in human beings can be attributed to direct or indirect transmission from animals.

Public health and animal disease prevention and control should be inseparable. Sanitary supervision covering the movement of live stock and the distribution of milk, meat or poultry products are not only problems for the consideration of this Association, but are problems that should be considered by local sanitary officials and the public in general. No law or regulation for preventing and controlling diseases of live stock can be successfully enforced unless sanitary officials and live stock owners are in accord and sufficiently familiar with the fundamental principles of disease control to bring about the desired results.

The controlling of live stock diseases, which now include poultry diseases, has been so universally extended that it becomes necessary that we who are actively engaged in disease control work be united in adopting fundamental scientific principles of live stock disease control with one thought in mind of promulgating uniform regulations, if we ever expect to accomplish much in the way of disease control.

In my judgment it is the duty of all sanitary officials to secure

greater uniformity in regard to all these matters, and above all, to use greater judgment and sound common sense in the promulgation of regulations to prevent the spread of contagious diseases. Also, it is very essential to have a thorough and full discussion of the whole matter between the authorities and the producers and consumers, who, after all, are the parties most vitally interested. Sanitary officials, and in particular sanitary inspectors, are inclined sometimes to think because of their official position that they are the persons most vitally and intimately concerned in the enforcement of live stock regulations.

We should have the intelligent, thoughtful and friendly collaboration of our state boards of health, as well as our state and county medical associations. Then, we must have the friendly coöperation of the United States Bureau of Animal Industry. With the coöperation of these professional elements and a thorough understanding with all interested parties and the working together of all these forces, there is every assurance that we will be successful in controlling contagious live stock diseases.

Some one made a statement in which he said that the science of veterinary medicine, sanitation and hygiene is not in any sense of the word a completed science. He further stated that the time will never come when there will be no need for veterinarians and no need for the science of living tissues, for the simple reason that the evolution of disease goes on constantly.

This statement is well founded, for we hear today of animals being infected with diseases which we did not hear of twenty or thirty years ago. Suddenly, diseases loom into prominence and we who come in contact with these unusual diseases or disease conditions debate the question as to whether this is a *new* disease or did it exist twenty or thirty years ago and we had no knowledge of it. Of course, the actual fact of the matter is, there were occasional cases of all these unusual diseases at an earlier period but the changes in methods of handling domestic animals have made these supposedly new diseases assume new importance. With our present-day knowledge of the causes of disease we are in a better position to make a positive diagnosis. Therefore, we are in a better position to control contagious and infectious diseases than we were twenty or thirty years ago.

In the face of the fact that all of this knowledge is available we must always bear in mind that we have to deal with interested laymen who have little or no knowledge of the causes of disease. With this condition existing we sanitary regulatory federal, state and municipal officials should always bear in mind that without the support and coöperation of the lay citizen, we

will encounter great difficulty in enforcing any rule or regulation. It, therefore, becomes necessary that the people of a state or community be educated to such an extent that they will see the wisdom in the adoption of the rule or regulation we propose to establish.

We have the advantage over them in being associated with the United States Live Stock Sanitary Association. This Association can justly be called the melting-pot where all scientific problems pertaining to the treatment and protection of live stock against the ravages of infectious disease are studied.

UNIFORM REGULATIONS

The uniform regulation is the fundamental structure upon which we must build if we expect our superstructure to stand in the controlling of live stock diseases. When this is done it will afford a better understanding between live stock sanitary officials, breeders and veterinarians to whom is entrusted the authority to control contagious diseases of live stock and poultry. The federal Bureau of Animal Industry regulations should be used as the foundation for the building of the superstructure of state regulations governing the importation of live stock. This rule also should be used in adopting regulations for the intrastate movement of live stock as far as local conditions will permit. True, each state has its individual problems. Nevertheless, state sanitary officials should coöperate with the representatives of the federal Bureau of Animal Industry in order that they may function properly to obtain the best results in sanitary control work.

In putting into operation coöperative policies in connection with state and federal agencies in the control of infectious diseases, several things must be taken into consideration. First, good, sound common sense should be used, accompanied by courteous treatment to all parties concerned, and particularly to the owner of the animals involved in the transaction. He is the one who is most vitally interested in a financial way as well as in the protection he expects to gain by coöperating with us in controlling the disease in his herd. Without his coöperation it is an utter impossibility to control the spread of disease successfully.

We are at times too prone to show our authority before the owner has an understanding of what we wish to accomplish.

One other essential thing must be understood if we expect to have thorough working coöperation—that is, where the federal agency's authority ends and the state agency's begins, and vice

versa. If there is not a thorough understanding on this point, complications are sure to arise which will upset very materially the working of our regulations, and may cause dissension and develop what are known as "objectors" to state laws and regulations, which ultimately lead to court procedures.

SWINE DISEASES

As far back as 1913, the United States Bureau of Animal Industry placed a force of inspectors in the field to demonstrate that hog cholera losses could be reduced and the disease controlled. This was supposed to be at that time the only disease of any serious importance with which the swine-breeder was confronted. Since that time, as you know, through the coöperation of this Association and the United States Bureau of Animal Industry, the control of hog cholera has been accomplished. But, in the meantime, other diseases of hogs have developed, or have at least been recognized, and are being reasonably successfully combated. The history of controlling hog diseases seems to be that we no sooner discover a treatment to control some one swine disease than a new or an unrecognized disease shows up and causes considerable loss to the swine breeder. I refer in particular to swine erysipelas. This disease, I know, will be well discussed during this meeting by our Committee on Transmissible Diseases of Swine.

TUBERCULOSIS

The work in the eradication of bovine tuberculosis has narrowed down to a supposed point that all that is left to be done is to take care of the testing of cattle in the range country and the protection against the re-infection of our clean areas. These questions must be given due consideration, as there is a great danger, if we are too lenient and careless, of upsetting the great work that has been accomplished.

BANG'S DISEASE

It is generally understood by research men and accepted by cattle-breeders that Bang's disease is a serious menace to the cattle-breeding industry. They, I believe, and we are anxiously waiting for this Association and the United States Bureau of Animal Industry to decide on and prescribe some method by which they can proceed to eliminate the disease from their herds. When this is done, I believe they will be more than pleased to coöperate with us in the eradication of this disease.

This Association, the United States Bureau of Animal Industry and the veterinary profession in general have been criticised

by some cattle-breeders for not adopting rules and regulations long before this for the accrediting of Bang-disease-free herds similar to the accrediting of tuberculosis-free herds. But, as time has gone on and they have learned more about the disease and how it is spread, and the many complications that may enter into the making of a positive diagnosis, they have found that their criticisms were not justifiable.

The Committees on Bang's Disease of this Association, as you know, in the past five years have carefully weighed all facts and arguments pertaining to this disease. They are to be commended for the careful way in which they have handled the many perplexing scientific problems with which they were confronted. These problems had to be solved before any practical, workable uniform rules or regulations for the control and eradication of Bang's disease could be adopted by this Association. Such regulations should have to do not only with the accrediting of herds, but must be of such a character that the Committee on Uniform Regulations for the Interstate Movement of Live Stock could adopt them.

In making a survey of the excellent work that has been done by the herein-mentioned committees, it may be found that some of the phases of this disease are still incomplete. However, with the knowledge now available, together with the educational progress of Bang's disease that has been disseminated to live stock owners through various agencies, agricultural publications and daily newspapers, it appears to me that the cattle-breeder understands the importance of ridding his herd of the disease and the danger of a clean herd becoming infected.

This Association, I believe, would be justified at this time in adopting uniform regulations for the control and eradication of Bang's disease.

True, some of us might argue from a technical point of view that the science of this disease is not complete. Granting this to be true and admitting it is a debatable question, nevertheless, an indisputable fact remains that a number of states with the knowledge now obtainable are successfully ridding their herds of Bang's disease, and their interests should be protected.

I do not want to take any more of your valuable time in attempting to discuss the numerous contagious and infectious diseases of live stock. We should bear in mind that this is an age of specialization and that it is impossible for any man, other than those who have specialized in certain lines, to have more than a general knowledge of the intricate workings of disease.

Therefore, I am going to take advantage of the knowledge of others and leave the discussion on disease control in the hands of the different committees assigned to do the work.

The committee work of this Association has in the past been sound and practical and has accomplished as far as possible the desired aim of this Association in disease control.

PRESIDENT MALCOLM: The next order of business will be an address by Dr. Francisco Moguel M., entitled "The Trend of the Animal Industry in Mexico." (Applause)

. . . Dr. Moguel read his address. . . .

THE TREND OF THE ANIMAL INDUSTRY IN MEXICO

By FRANCISCO MOGUEL M., Washington, D. C.

Attaché to the Mexican Embassy

In the paper that I had the distinction to present before this honorable body last year, I pointed out the measures that my government has taken to stimulate the development of our live stock industry, as well as the sanitary measures for the control of the various infectious and parasitic diseases and to prevent the importation of such other diseases that do not exist in the country. At this time I wish to outline what has been achieved by the application of these measures from December, 1931, to date; especially I wish to outline the trend of the industry, regretting that I cannot do so at the length I desire because of the limited time available to this honorable assembly.

It is a common belief that during periods of acute economic crisis all diseases of live stock, especially epizootics, develop greater intensity. Without doubt the only reason for this is that the losses occasioned by these diseases are more severely felt as they are added to losses that have been met with from other causes. Mexico, in common with other countries of the globe, has passed through the same difficult situation of which we are all weary, not only of its effects but also of hearing discussions of it. Fortunately in my country the epizootics have not developed on this occasion in any alarming manner; on the contrary, the general sanitary conditions in the live stock industry are very satisfactory, as may be seen from the data in our monthly Bulletin of Epizootics of the Department of Medicine and Animal Health.

The principal diseases that have appeared and which are the most frequently met with are anthrax, symptomatic anthrax,

splenic fever, hemorrhagic septicemia, hog cholera and fowl cholera.

Anthrax appeared in 53 distinct districts, attacking cattle in 45 of these and in the remainder involving equines, goats and swine; resulting in a total death loss of only 888 animals. Of these, 841 were cattle, 38 equines, 4 goats and 5 swine. In these districts the veterinarians of the Bureau accomplished the prophylactic vaccination of 11,122 cattle, 175 equines and 38 sheep. In addition, notices were had of the appearance of the disease in 46 other districts with respect to which data relating to the number of cases and the number of deaths are not yet available. However, these outbreaks were not severe because in cases where they develop great intensity the growers are accustomed to communicate immediately with the proper office so that the necessary measures may be taken. Furthermore, systematic vaccination generally is practiced and the animals that escape such treatment are very few. Last year the number of instances of the disease was about 100, by which it will be seen that it is well under control.

Symptomatic anthrax was found in 71 different districts, causing the death of 227 animals, and there were vaccinated in the quarantined zones 8,408 animals in addition to those that were immunized by the owners.

Hemorrhagic septicemia attacked various species in 87 districts, killing a total of 3,000 head and in these districts 5,389 animals were vaccinated.

Hog cholera appeared 42 times occasioning the death of 832 animals. Twelve thousand three hundred and forty-three hogs were immunized in the districts in which the disease appeared.

Fowl cholera developed in various localities but its spread is being brought under control, 15,954 birds having been vaccinated by veterinarians of the Bureau as an educational measure looking to the prevention of this disease.

In the case of avian diphtheria it is the practice to sacrifice immediately all diseased birds and those that are suspicious, controlling and preventing the spread of the disease in this manner as well as through the employment of other prophylactic measures.

Infectious abortion of cattle, which is another of the diseases that is causing trouble in the industry, is being combated with great vigor in order to bring it under control which we are hopeful of doing, as, fortunately, it has not been widely disseminated in the Republic. In the Federal District, within which are located the principal dairy centers, in the places in which the

disease has appeared with major intensity, it was found, for example, that of 515 animals 66.6 per cent gave negative reactions, 23.49 per cent positive and 9.9 per cent suspicious reactions. In the state of Mexico, in the districts in which the disease is most common, the negative reactions represented 66.59 per cent, the positive 23.23 per cent and the suspicious 10.17 per cent. In the milk-producing centers of the different states the situation is better, as 86.12 per cent of the animals gave negative reactions and only 10.40 per cent and 3.46 per cent gave positive and suspicious reactions, respectively. By this it will be seen that this disease is found in only a few scattered districts, appearing especially among the better bred animals. For this reason we are exercising strict supervision over importations, preventing the entry into the country of reacting animals and, in addition, enforcing rigidly the segregation of infected animals.

With respect to pullorum disease, very careful work is being carried on and little by little it is being brought under control. Up to January 1 last, federal veterinarians made 86,500 rapid, stained-antigen, whole-blood agglutination tests, as well as many more by other laboratory methods, with practically the same results. It was found that the percentage of positive reactions is very low. It was noted that the disease is observed especially among well-bred imported birds and very rarely among our native fowl.

Bovine tuberculosis is not a serious problem in our live stock industry, as may be seen by the following data: In the Federal District the Department of Public Health, which is in charge of this work, tuberculin-tested 8,882 cattle during the first half of this year, of which only 292 gave positive reactions and 447 suspicious. Outside of the Federal District and other similar milk-producing areas, the disease exists in a very slight degree.

There is no doubt that the principal sanitary problem is piroplasmosis, because of the extent of our infested zones. However, the campaign against ticks is being carried on in a most active manner and, up to July of this year, there had been placed in operation 401 vats in the zones in which systematic work is conducted, 116,793 animals being dipped every 14 days.

In consequence of the work described by Records and Vawter demonstrating the existence of bacillary hemoglobinuria in the state of Nevada in this country, the disease has been diagnosed in the states of Michoacan, Hidalgo, Puebla and Chihuahua, in Mexico. It had been believed that the losses occasioned by this disease had resulted from anthrax or piroplasmosis.

Other infectious diseases have not developed to such an extent as to constitute any serious problem.

Among the parasitic diseases, mange, or scabies, of cattle appeared on two ranches in San Buena Ventura County, Chihuahua, and 9,222 animals were dipped in a lime and sulfur solution, resulting in the eradication of the disease.

Liver flukes are found frequently in our southern states, being combated by means of adequate drainage of inundated lands as well as by the use of sulfate of copper.

From the foregoing it will be seen that in general the sanitary condition of our live stock is quite satisfactory. We have controlled as far as possible the spread of the more common infectious and parasitic diseases by means of controlling the movement of live stock, the strict application of quarantine measures and putting in practice all other prophylactic methods, especially the immunization of susceptible animals. For this reason it has been necessary to increase the capacity of our laboratories, not only with respect to the volume of products previously elaborated, but for the preparation of additional products, inaugurated at the beginning of this year.

For the purpose of unifying the work of all the technical personnel, there was celebrated, November 13-20, the annual convention of Bureau veterinarians for the discussion of problems that arise in the zones in their charge. There were discussed the personal experiences gained by each one in the work carried on. A very successful convention was had and the application of the resolutions adopted will without doubt result in a more effective control of live stock diseases.

During the outbreak of foot-and-mouth disease in California, last April, our inspection force at the border was increased. At the same time, through the operation of the International Treaty between our countries for the prevention of the introduction of infectious, contagious and parasitic diseases, I was in a position to obtain daily bulletins of the progress of the eradication work from Dr. Mohler and his staff. The reports were immediately dispatched by wire to headquarters in Mexico. With the knowledge and understanding of the thorough steps taken by this government to control the outbreak, and conscious of the seriousness of the problem with respect to trade between the two countries, we believed it unnecessary to restrict trade in any larger area than that under quarantine by your government and were able to lift this restriction at the same time that this government released the area from quarantine.

The general tendency of our animal industry is to accomplish

the extinction of our native species, replacing them with animals of better breeding, in order to improve the quality of their products. In addition we have persistently endeavored to stimulate consumption in the large centers and fortunately this has been increasing continuously and markedly. As a result the introduction into the country of the registered animals has been favored in every way possible. There have been imported this year, up to August 1, 666 pure-bred cattle of beef or milk type, 994 pure-bred sheep and 260 goats, for the betterment of the production of milk, wool and mohair. Much attention has been given to teaching producers how to obtain more and better wool. Organizations of growers have been formed in order that their production may be marketed to better advantages.

As the agricultural industry is not yet developed to the extent that machinery can replace draft animals completely, the improvement of our native horses, which are already famous for their good qualities, has gone forward. We are endeavoring also to accomplish the importation of pedigreed animals, 834 horses and 58 asses of good breeding having entered the country during the period above mentioned.

Our consumption of lard is enormous and the production of swine is one of the industries which presents the greatest opportunity for future development and which we are endeavoring by every means to stimulate. This has been accomplished in part. During the present year, up to August, there were imported a little more than 10,000,000 kilos of lard, as against double that amount during the same period of the preceding year. This should not be interpreted as being due to diminished consumption, as there were imported 795 pure-bred breeding animals of the lard type.

Another branch of the live stock industry that has progressed notably is aviculture, as our importation of eggs and poultry for consumption has diminished. For example, last year there were imported 11,687 crates of 30 dozens each, whereas this year, up to August, only 330 crates have been imported, almost all of these for consumption in our frontier cities. These figures become more notable when they are compared with those of five years ago, when more than 73,000 crates were imported in one year; that is to say, that already we are almost within reach of satisfying our domestic market, and the improvement of our poultry is shown by the results of laying contests. Nor must it be surmised in this case either that the figures given indicate diminished consumption. For example, in only five consignments,

22,273 chicks and 7,900 hens of the egg-producing breeds were imported.

All the figures hereinbefore mentioned, which refer to animals imported up to August, have at this date been considerably augmented, as there was held, two weeks ago, the National Live Stock Exposition, at which there were assembled numerous foreign animals, all pedigreed, for the importation of which all possible facilities were offered. It is on such occasions that our growers acquire their breeding stock.

The Exposition, according to information that I have just received, was a surprising success, demonstrating that the improvement of our animals has made great progress. If there were presented now one of the animals that won first honors a very few years ago and one that did so recently, an enormous difference would be seen. This has been observed in the various regional expositions held during the current year.

As I have stated heretofore, the trend in our live stock industry is towards improvement of our breeds and especially an increase in the domestic consumption of animal products, as our most active campaigns have been carried on with this object in view. The exportation of animals to compete in foreign markets is not in any manner our point of view. It has been represented that there are at this time, on the other side of the Rio Grande, millions of head of cattle ready for exportation to this country at a low price and that were it not for the tariff barrier they would constitute a tremendously strong competition for the cattle here. This competition we have never sought to establish nor could we do so for the reason that, in the first place, we are far from having such a number available, as not even during the period of our heaviest exportation, the period of the war, which coincided with the liquidation of our herds because of political disturbances, was any such figure reached; and in the second place, if we take into account the relationship between the number of animals slaughtered for domestic consumption and the number exported to this country, it will be seen that such competition is not possible.

Our exportation is not for the purpose of competition but to fill a need and is nothing more than the natural tendency toward commercial interchange between neighboring centers of production and consumption, which is of mutual advantage through the sale of live stock on the one hand and the consumption of products of other classes on the other. If it is true that the tariff barriers have impeded the entry of our cattle, it is also certain that they have caused a complete suspension of this interchange

with corresponding disturbances of trade, without having accomplished the protection of the industry. Importations into the United States are not important factors in the price of cattle, because, in spite of the tariff barrier, which has largely stopped such importations, prices have gone lower.

As I have just stated, our exportation is not competition but is filling a need because if we consult statistics it will be seen that the consumption of meat in this country is at present greater than production. It is necessary only to examine the following figures: During the period from 1840 to 1862, the number of cattle increased from 14,000,000 to 54,000,000. After the latter date, the number fluctuated considerably but in general increased until 1918, when it reached its highest point with 71,000,000 head. Following that year the number diminished, at first rapidly and later more slowly, between 1920 and 1928. From the latter year up to the present, the normal rate of increase has prevailed, there being 51,000,000 head in 1931. This increase was in very large part among cattle of the dairy breeds, as is shown by the fact that, from 1900 to 1924, the increase in the number of cattle of this class was 26 per cent, whereas the production of meat animals diminished 10 per cent. The contrast would have been more striking had it not been for the European war, which required the strongest possible efforts to increase the production of beef cattle. From 1930 to 1931, there was an increase of about 970,000 animals, of which 532,000, or more than one-half of the total, were dairy cattle. If we compare the above figures with the growth in human population, it will be seen clearly that the proportion remained about the same until 1890. At that time the opening up of public lands for agricultural development was begun and it was then that the number of beef cattle and sheep began its descent in comparison with the human population. This is shown also by the fact that the number of dairy cattle and swine which are farm animals has been increasing, demonstrating that agriculture develops at the expense of the grazing industry. Furthermore, we find that the number of cattle slaughtered was in the neighborhood of 7,600,000 annually from 1907 until 1912. From 1915 to 1918, it increased rapidly, reaching 12,000,000 in the latter year. This was during the period of European conflict, which demanded an enormous exportation of meat. This was of short duration, however, as two years later the number had fallen to 8,000,000 head, the figure at which it has remained, with slight fluctuations, up to the present time.

Comparing the figures on importation of cattle from both

Mexico and Canada with those slaughtered in this country, the first-mentioned are seen to be really insignificant.

Animals Imported from Mexico and Canada

<i>Year</i>	<i>Canada</i>	<i>Mexico</i>	<i>Total</i>
1927	168,000	99,000	267,000
1928	343,000	204,000	548,000
1929	256,000	309,000	566,000
1930	192,000	226,000	419,000

These figures are not exactly the highest, as in 1914 Mexico exported more than 600,000 head and Canada 200,000, but this was due to the war demand, as I have already explained, at which time also cattle were free of duty.

I have endeavored to analyze, although in a superficial manner, the state of the live stock industry from past years up to the present, and with the figures cited it is clearly demonstrated that its development has had its transitions. This is not because it has not been given attention. On the contrary, here more than in any other part of the world it holds a place of importance and enjoys the support of a distinguished group of individuals such as those here present, who have religiously dedicated their lives and their enthusiasm to its betterment, bringing it to its advanced position. Many complex conditions have operated to bring it to its advanced position, and there is no doubt that the diminished production of meat animals is due to the increased development of agriculture and the cultivation of lands formerly devoted to grazing; that is, there has been a transition from extensive to intensive exploitation under the pressure of rapid growth of the human population, as grazing is especially an activity of the poorly populated regions. However, the live stock industry has the privilege and the honor of opening the doors to the development of agriculture and sustains it with its strong arms. And when the soil becomes exhausted through intensive cultivation, live stock returns to restore its strength.

The agricultural perfection reached in this country has brought about an overproduction of grains suitable for fattening live stock, not all of which can be utilized. As a result, prices have gone so low that it is said that quantities of these grains are being used as fuel. Mexico exports only thin cattle and were it not for the tariff these would come in to consume some of this surplus and transform it into meat.

The demand for meat animals, by reason of the European war, brought a notable rise in prices. In 1913, steers of 1,200 to 1,350 pounds were quoted here in Chicago at \$12.00 per hundred, whereas, in 1918, the price had risen to more than \$20.00 per

hundred. This was a great stimulus to the industry. Banks and other financial institutions extended ample credit, and the price of live stock was sustained for some time. Finally, however, there was a precipitous fall in prices, as a result of the cessation of hostilities, so that, by the end of 1920, they had reached \$9.00 per hundred and at the end of 1921, had fallen to \$7.00. In consequence of severe droughts, prices of grazing cattle had gone very low and the banks, in order to safeguard their investments, increased the credit extended, but the depreciation continued in an alarming manner, making it necessary for them to try to collect their loans. As a result, great numbers of animals were marketed for slaughter that were not ready. This liquidation caused numerous financial failures. The assistance extended by the government went far to alleviate the situation. It is not necessary to mention the prices that now prevail, as we know too well how low they are. What I desire to point out, however, is that as there have been no importations of cattle from Mexico or Canada, that can not be a cause for the falling prices, which must be ascribed to the economic crisis.

Customs duties upon the importation of cattle have existed for many years, except that during the period 1913 to 1921 they were admitted free of duty. Since the latter year, duties have been increased, particularly under the tariff act of 1930. If we review the prices of live stock before and after the imposition of each new tariff, it will be seen that the duties have had the effect of lowering prices in the other countries without raising domestic prices. This naturally reduces purchasing power in the neighboring countries that normally buy live stock and products in large numbers and volume in the United States. It seems clear that importations of live stock into this country are not a factor in either higher or lower prices, as their number is insignificant. It may be alleged that the entry of great numbers at any given time can influence prices locally, but this can not happen because importations are spread over certain periods and because the marketing system is so well regulated that such ups and downs in any pronounced form are not possible.

It should not be thought that, although Mexico now can not send any number sufficient to influence prices, she can do so later. That is not true, because it must be taken into account that our agrarian policy is distinct as compared with the past. At the present time agricultural property is being divided, giving impetus to the intensive form of development of the live stock industry in harmony with that policy. Thus we are passing through a phase that has already been traversed in this country.

DISCUSSION

DR. A. W. MILLER: I am sure I voice the views of this Association in saying that we feel highly honored in having had Dr. Moguel on our program last year and again this year. His description of the live stock disease situation and the live stock conditions in general in Mexico has been most interesting.

Dr. Moguel, in his paper, referred to the California outbreak of foot-and-mouth disease. Heretofore, when we have had an outbreak of foot-and-mouth disease in this country, traffic with Mexico has been practically dislocated. This year there was practically no interference with traffic from this country to our sister republic on the south. I am sure that this situation was due to the part that Dr. Moguel took, owing to his intimate contact with us in Washington. We who have dealt with him in that city hold him in the highest esteem. (Applause)

PRESIDENT MALCOLM: Gentlemen, you have listened to a very fine discussion. There may be some questions that you might want to ask Dr. Moguel. If you do, feel free to do so.

DR. MILLER: Dr. Moguel referred to hemorrhagic septicemia. Was that reference to hemorrhagic septicemia in cattle?

DR. MOGUEL: Hemorrhagic septicemia developed in all species but especially in cattle. We sent cattle from tropical regions in Mexico to places that were very high and very cold. The disease developed more rapidly for that reason.

DR. LEE M. RODERICK: Mr. President, I have a telegram here that I think is of great interest to this organization.

I left home last Thursday, and I learned yesterday that Dr. Crewe was seriously ill. I sent a telegram inquiring about his condition because of the interest of all of us, and I have just been handed this word:

"Dr. Crewe passed away at five-forty o'clock this morning.

Funeral at two-thirty Thursday."

DR. C. A. CARY: I move that the Secretary be authorized to send a telegram of condolence to the family.

DR. N. S. MAYO: I second the motion.

DR. R. R. DYKSTRA: In view of the fact that Dr. Crewe was a past president of this organization, it seems to me it would be a nice thing if we would also send some flowers. We can telegraph flowers in time for their arrival for the funeral. I believe that should be done, and I so move.

PRESIDENT MALCOLM: It is moved and seconded that the Association send a telegram of condolence to the family of Dr. Crewe, as well as flowers to the funeral. Are you ready for the question? All in favor of that motion will say "Aye"; opposed, "No." It is carried.

If it is agreeable, we will stand adjourned and reconvene at one o'clock. I want you to understand that this is your meeting.

. . . The session adjourned at 11:35 a. m. . . .

RECESS

WEDNESDAY AFTERNOON, NOVEMBER 30, 1932

The second session convened at 1:25 p. m., President Malcolm presiding.

PRESIDENT MALCOLM: The first order of business will be a discussion of "Control of Bang's Disease under Range or Semi-Range Conditions," By Drs. W. J. Butler and D. M. Warren, of Helena, Mont. (Applause)

DR. W. J. BUTLER: Mr. President and Members: The experimental

data on which this paper is based have been collected by Dr. Warren, under his personal supervision. We have tried to condense this paper as much as possible. We have a great deal of data that are not cited in this paper.

. . . Dr. Butler read the paper. . . .

CONTROL OF BANG'S DISEASE UNDER RANGE OR SEMI-RANGE CONDITIONS

By W. J. BUTLER and D. M. WARREN

*Montana Livestock Sanitary Board
Helena, Montana*

Bang's disease may be controlled in range and semi-range cattle by the practice of present known methods for the control of Bang's disease. It is more difficult to control Bang's disease in our herds than it is to control tuberculosis. Many difficulties present themselves in the control of this disease but these difficulties are not insurmountable. The *eradication* of Bang's disease in range and semi-range cattle, by present known control measures, is prevented by financial as well as physical limitations.

Range cattle are cattle that run in the open the entire year without being fed cut herbage. Semi-range cattle are cattle that run in the open the greater part of the year but are gathered in the fall, placed in pastures and are fed cut herbage during the winter months.

In many sections semi-range cattle remain out in the open until they are driven down from the hills and sheltered areas by snow and inclement weather. In Montana this time varies from year to year. It may be in October or it may not be until December. It all depends upon the weather. During the grazing season cattle from different herds mingle with each other. To gather all range or semi-range cattle during the grazing season would be a Herculean task that stockmen would hesitate to undertake. To hold these cattle, if it were possible to gather them, during the grazing season and subject them to repeated blood tests would not only be ruinous to the stockgrower but would be financially and physically out of the question.

BLOOD TESTING

We firmly believe in the effectiveness and reliability of the blood test. Nevertheless, there are many circumstances that prevent us from relying upon this method of control in a number of our beef herds.

In a number of our range and semi-range beef herds we have reduced the actual number of abortions by the practice of sani-

tation, sound breeding principles and good herd management, without recourse to the blood test.

Where it is possible and practical to blood-test animals in an infected herd, then we blood-test all breeding animals in the herd and remove reactors. There are no range or semi-range herds where the practice of 30-day blood-testing may be applied. However, we do find many semi-range herds where we may apply one and sometimes two or three blood tests a year. In these herds we are able, at least partially, to apply the principles of control as advocated by the blood-testing method. Where this is possible we believe the most advantageous time to test, if one test is to be conducted, is in the fall at shipping time. This enables the owner to ship reactors to market and it also removes reactor cattle from the herd before they are placed on winter feed, during which period contact and spread of infection is most pronounced. The one disadvantage of testing at this time of the year is that a certain percentage of cows have to be tested soon after service, as bulls are generally taken out of the herd at the time of fall testing.

We classify as reactors all animals giving a 1:25 agglutination titre or higher. As has been stated, it is impractical to blood-test at 30- or 60-day intervals. Therefore, it is not safe for us to disregard a 1:25 reaction. There is no way to determine whether this reaction is what has been termed an immunizing reaction or a reaction from an animal in the incubative stage of Bang's disease. It is needless to state that, if the animal is in the incubative stage, she may be a spreader before the next test is conducted. If such an animal is not removed from the herd and she becomes a spreader, the benefits derived from the previous test would be discounted, if not negligible.

SEGREGATION OF REACTORS

It is more practical to ship reactors than it is to segregate and hold them in quarantine under pasture conditions. We also advise owners of infected beef herds to ship their dry cows in the fall. Dry cows, even though reactors, ordinarily are not spreaders. Neither their uterus nor mammary glands are functioning. They should be fat in the fall and worth more money on the market than in the spring. That is the principal reason for shipping them.

We have pure-bred herds handled in large pastures where segregation and quarantine of reactors in separate pastures is practical but these herds are the exceptions.

Limited pasture grazing and winter feeding conditions are

more favorable for the spread of Bang's disease than open-range grazing conditions. The danger of the spread of disease under open-range conditions is limited. The eventuation of disease ordinarily depends upon the degree of infection, that is, mass infection. Range cattle are proportionately not subject to the same danger of mass infection as small-pasture or winter-fed cattle. Range cattle do not run in large groups. Seldom are they seen in other than small groups unless when rounded up or when grazing in restricted areas or around water holes or during inclement weather.

Winter pasture and winter feeding conditions are more favorable for the spread of disease. Ordinarily in winter feeding operations hay is thrown on the ground. Naturally if a spreader of infection is in a herd fed in this manner, the infection from that animal gets on the ground, contaminates the hay and more than likely infects susceptible animals. It is a poor procedure for animals to graze over their own excreta or that of other animals.

Herd DJ consisted of 140 animals which were tested in the fall, showing 16 reactors. Due to the lack of coöperation on the part of the owner, five of these animals were allowed to winter with the remainder of his herd. When they were tested the following spring we found 48 reactors in this herd. While this is not so large a percentage of reactors as we sometimes find, still it does point to the fact that the spread of infection during the winter months is something that must be guarded against.

We have in mind another herd, designated as S, consisting of 110 animals which were tested in the fall, showing 14 reactors. This herd was inaccessible for supervision and the reactors remained with the herd. When the herd was tested in the spring we found the 14 original reactors and 49 new reactors.

These herd cases illustrate the danger of spreading disease under winter feeding conditions. To illustrate the lessened danger of the spread of disease under range conditions we cite the following case.

Herd M consisted of 116 animals in which, on the test in the spring, we found 11 reactors. These animals were allowed to remain in the herd during the summer and run on the open range. Drought and feeding conditions prompted this action. When they were tested in the fall, ten of the original 11 reactors again reacted, with one clean-up. No new cases had developed during that time.

IDENTIFICATION OF ANIMALS

In blood-testing range and semi-range cattle the individual

identification of animals is a difficult and serious problem. We can identify the herd easily enough by the owner's brand, but that does not identify each individual. We have found a stenciled lacquer or paint mark—and lacquer is better than paint—fairly satisfactory for temporary marking, that is, for identification of the animal between the time of securing the blood and obtaining the laboratory findings. You can ride through the herd and pick out the reactors by their numbers, saving corralling the herd and running them through a chute. We use eartags occasionally but they are not satisfactory. They pull out of the ears when they get caught in barbed-wire fences or on brush. Also, they will freeze out occasionally. Owners generally object to burned number brands. They have their holding brand on the animal and most stockmen object, and rightly so, to more brands being placed on an animal. The most practical and satisfactory method of permanent identification that we have found is an ear tattoo. In tested herds we remove reactors and in most cases ear-tattoo non-reactors for future identification, if not already individually identified, as in the case of most pure-bred cattle.

WINTER FEED-RACKS

In our program of control we strongly advocate the use of feed-racks for winter feeding. Feed-racks for winter feeding are a distinct rarity on most western ranches. On most ranches movable racks are more practical than stationary racks. While some stockgrowers claim that feed-racks are not practical and they get better feeding results from scattering hay over a considerable area, nevertheless in many winter feeding operations feed-racks are practical and wherever practical they should be placed in operation. Where feed-racks are not considered practical, hay should be scattered over as large an area as possible with good herd management and the feed grounds should be changed as frequently as conditions will permit.

LIMITED BREEDING SEASON

The breeding season should be limited to three or four months. If the breeding season is limited, naturally the calving season will be limited likewise, and the period of greatest danger for the spread of the disease limited to the same extent and not spread over the entire year as in the case of most dairy herds. In Montana we advocate the turning of bulls out on the open range on or about July 1. We advise the gathering of them early in October. We realize that it is impossible to gather all bulls that early. As has been stated, many cattle do not come

down from the mountains until snow and winter weather drive them down. We also realize that this limited breeding program may not be established in one year. The loss in the calf crop due to cows not being bred would be too great, but this system of breeding can be established gradually without increased danger of cows going unbred. Nature is responsive enough so that cows will come in season in sufficient time to be bred, even if bulls are gathered a little earlier each year until the October schedule is reached. This limited breeding period may require the use of a few more bulls, but the benefits derived will more than offset the additional investment in bulls.

A limited breeding season is not only indicated in the control of Bang's disease in range and semi-range beef herds, but it will eventually result in a larger and more uniform calf crop, as well as prevent considerable death loss in calf life.

Montana law provides that bulls shall not be on the open range, highways or forest reserves between January 1 and July 1 of any year.

SEGREGATION OF HEIFERS

We believe that heifers should be segregated from the main herd and held until they are two-year-olds, before they are turned out with the breeding herd. We have no experimental data to support our claims, but it has been our observation that such a practice is productive of better calves and we are convinced such a breeding practice tends to reduce the spread of Bang's disease.

BLOOD-TESTING BULLS

We have found in every badly infected herd one or more bulls affected. We find that bulls in many instances lose their reactions four to six months after discontinuing breeding. We have also observed that the agglutination titres of bulls gradually increase in many instances when they are placed in service. This is one reason that we classify as reactors animals that give a titre as low as 1:25.

We realize the controversy that exists over the bull as a factor in the spread of Bang's disease but, nevertheless, we do believe that the bull in many instances is a factor in the spread of the disease and we feel that it is not consistent with good sanitation and sound breeding principles to allow a bull showing a reaction to remain in any breeding herd.

It is our advice to stockmen that they remove and throw out of service bulls which give a reaction as low as 1:25. There may be exceptions and we have been guilty of making an exception in a pure-bred herd which was under complete supervision at all

times and where the owner desired to experiment. In this infected herd, which we will classify as 0, there were two bulls which gave positive reactions at the end of the breeding season. One of these gave a reaction at 1:100 and the other at 1:400. These bulls were placed in isolation and were tested again the following spring, with the result that both animals gave negative reactions. They were placed in service again, with clean cows, and tested repeatedly. After two years of repeated testing, neither of these bulls ever gave a positive reaction again. We do not practice this procedure, but it is given as an illustration of what may occur.

In another herd we had directly opposite results. This herd we will designate as H. This was a dairy herd where the owner wanted to breed his heifers with an Angus bull. He purchased the bull with the provision that he give a negative reaction for Bang's disease. On the initial test this bull gave a reaction at the 1:25 dilution. Against our advice the owner decided to hold this bull for a retest. At the end of 60 days the bull was retested, giving a negative reaction. He then was placed in breeding service with a segregated number of heifers. He was tested again in 60 days and at that time showed a reaction of 1:100. He was placed in isolation again and at the expiration of 90 days was tested and found negative. He was placed in breeding service again. At the expiration of 60 days, he was retested and gave a positive again. This bull was destroyed and the genital organs submitted to the Montana Livestock Sanitary Board laboratory for examination, with the result that a focus of infection was found in one of the testicles, from which *Brucella abortus* was isolated.

These concrete cases are cited to you simply as illustrations of how dangerous it is to play with fire, that is, any animal that gives even a low-dilution reaction to the blood test for Bang's disease.

MATERNITY PASTURES

Wherever it is possible, we advocate the maintenance of what we term "maternity pastures." As you will easily realize, it is impossible, under range and semi-range conditions, to maintain maternity stalls. In many instances, however, it is possible and practical to maintain maternity pastures. These maternity pastures, in a limited way, answer the same purpose as do maternity stalls in the handling of dairy cattle. It is advisable to have three pastures: one for the main herd, one for cows about to calve and one for cows that have already calved and cleaned. On

many ranches three pastures are out of the question, but ordinarily the owner can maintain two pastures. This is better than only one general pasture. The owner is advised to watch his breeding cattle each morning when they are fed and to cut out and remove immediately to the maternity pasture every cow that shows signs of calving. In most instances this can be determined some time before the animal actually calves. If only one extra pasture is provided for, this pasture may contain steers, dry cows and cows that already have calved, but not cleaned. In such cases cows which have calved and cleaned may be returned to the main herd. If two extra pastures are provided, these cows, that is, cows that have calved and cleaned, should be moved into the second pasture.

We realize fully that this is not an ideal control method and that infection may be spread to nursing cows. We fully appreciate that the rancher may not locate and remove every animal that is about to calve and that slips will occur, but to a certain extent it prevents the danger of spread of the disease and makes the gathering of afterbirths and infected material much easier.

CLEANING AND DISINFECTING PREMISES

We recommend that all premises be cleaned and disinfected wherever possible. This procedure may not be easy and cannot be done in some of the larger ranches as effectively as is possible on small farms, but it would not be consistent with good sanitation if an effort were not made to clean and disinfect infected premises. After-births and infected material should be removed from pastures. The ground where after-births have lain should be sprinkled with lime or some reliable disinfectant or burned over. In severe winter weather this procedure is not always practical or even possible, but wherever such a procedure can be carried out it should be done.

CONTROL AREAS

Provision should be made for control areas. It is not good preventive medicine to blood-test a herd, segregate reactors, follow a strict sanitary outline for the control of disease and then turn that herd of cattle out on the range with untested and possibly diseased animals. We believe individual good comes from the cleaning up of any herd and that the calf crop may be increased materially by following the principles outlined in this paper and those practiced by many sanitary officers. That, however, does not overcome the fact that it is not consistent to turn clean animals out with infected ones. We are of the opinion

that, as finances permit, control areas will be provided for somewhat similar to the area plan for the eradication of bovine tuberculosis.

In Montana we have attempted to follow this general idea in restricted areas. We are convinced that it will be necessary to carry out a definite program of this kind to make blood-testing of cattle and segregation of reactors in range or semi-range herds a practical and feasible plan.

The subject of this paper is "The Control of Bang's Disease in Range or Semi-range Cattle." We trust you will pardon us for deviating from the strict interpretation of the title. We do this for the reason that we find conditions associated with Bang's disease which are materially important to the stockgrower. It is a difficult task and one that has considerable expense attached to it to round up cattle. If a stockgrower gathers his cattle, places them in a corral, runs them through a chute, permits them to be marked for identification and holds them for the results of the blood test, he is entitled also to an examination for other conditions which are oftentimes associated with Bang's disease. We refer particularly to vesicular vaginitis.

VESICULAR VAGINITIS

It has been our observation that, in all herds badly infected with Bang's disease, we invariably find vesicular vaginitis. In contradistinction, we have never observed vesicular vaginitis in a herd free from Bang's disease. These statements are based on the examination, primarily for Bang's disease, of 342 herds of cattle. We do not claim that there is a definite etiological relationship between Bang's disease and vesicular vaginitis, but we do maintain that they are so often associated in range and semi-range cattle that an examination or test for Bang's disease invariably should be accompanied by an examination for vesicular vaginitis. In range and semi-range herds of cattle with poor breeding histories, an examination should be made for vesicular vaginitis and this factor eliminated before we jump at the conclusion that the large number of dry cows is due to an uncomplicated outbreak of Bang's disease.

We have found in the treatment of vesicular vaginitis that an irrigation of the affected parts with a 5 per cent solution of sodium bicarbonate, followed by swabbing the affected parts with a 1 per cent acriflavine solution, has given excellent results. In herds where it is possible to do so, the application of the acriflavine solution should follow the application of the sodium bicarbonate solution, after the expiration of an hour or slightly more.

Also, in herds where it is possible to do so, this treatment should be repeated every three days until permanent results have been obtained.

Naturally in range herds it is impossible to follow this ideal method. In many range animals affected with vesicular vaginitis, we have found that they have cleaned up after one thorough treatment.

It may not be amiss for us also to state that we have had very favorable results with acriflavine in the control of actual abortion. We do not claim that acriflavine cures Bang's disease, but we do claim, without reservation, that we have had excellent results in preventing actual abortion and the spread of Bang's disease and in reducing the number of non-breeders by preventing or minimizing sequelae of Bang's disease. We have used acriflavine intravenously, using approximately 1 cc of a one per cent solution for each 10 pounds of live weight. We have given larger doses than this without producing any ill effects. We have had apparently good results also in drying up uterine discharges and thus preventing spread of Bang's Disease, by placing in the uterus of cows that have aborted one or two of the ordinary uterine capsules for loosening fetal membranes, and after these membranes have been removed, placing one or two ounces of a 1 per cent solution of acriflavine directly in the uterus.

Feed and diet must be taken into consideration in the control of abortion in range and semi-range cattle. In this statement you will note that we say "abortion" and do not say "Bang's disease." We are well aware of the fact that there has been considerable work done to disprove the diagnosis or the question of nutritional abortion. We have proved quite conclusively to ourselves that, where cattle are on limited feed in the winter time and where they have access to a large number of pine needles, we will occasionally have a high percentage of actual abortions in such animals. Repeated blood tests on a number of cattle in these pine-needle areas have failed to disclose any reactors to the blood test for Bang's disease.

A potent safe vaccine for the prevention of Bang's disease naturally is the ideal solution in the prevention, control and eradication of Bang's disease in range and semi-range cattle. Such a vaccine, however, is not at hand. Until a reliable and safe vaccine is produced we must proceed along the principles outlined. We must guard against the indiscriminate use of unsafe and unproved vaccines. We trust that there will be no let-down in an effort to produce a reliable and safe vaccine and that the

several research and disease control agencies will coöperate in an endeavor to produce such a vaccine.

SUMMARY

We summarize briefly the control measures outlined in this paper for the control of Bang's disease in range and semi-range cattle:

1. Blood-testing of all breeding cattle in infected herds where blood-testing is practical.
2. Segregation or shipping of reactors. Classifying as reactors all animals that give an agglutination titre of 1:25 or higher.
3. Positive identification of tested animals.
4. Providing feed-racks and clean feeding grounds.
5. Limited breeding season.
6. Segregation of heifers.
7. Blood-testing of bulls.
8. Providing maternity pastures.
9. Cleaning and disinfecting of contaminated premises.
10. Provide for control areas similar to area-testing in tuberculosis eradication.
11. Chemical therapy.

PRESIDENT MALCOLM: Is it your wish that each paper be discussed as read, or do you want the discussion held over until all of the papers on this subject have been presented?

DR. C. P. FITCH: I would suggest that you withhold the discussion until all the papers and reports have been presented.

PRESIDENT MALCOLM: If that meets with your approval, gentlemen, the next on the program is a paper by Dr. T. E. Munce, of Harrisburg, Pa., "Bang's Disease in Relation to Interstate Cattle."

. . . Dr. Munce read his paper. . . .

BANG'S DISEASE IN RELATION TO INTERSTATE CATTLE

By T. E. MUNCE, Harrisburg, Pa.

Director, Pennsylvania Bureau of Animal Industry

The right of the states to determine their own policies, laws and regulations has been debated and has remained unsettled since the time of Alexander Hamilton and Thomas Jefferson, around 150 years ago. One group, led by Hamilton, advocated a strong centralized government with limited and restricted powers by the states. The other group, under the leadership of Jefferson, believed in the inherent right of the states and in

strong local governments without federal domination or interference.

Events reveal that the question of states' rights, although some may hesitate to term it so, is a live issue even today. No less so in the prerogatives of the individual states to determine as to their policies and actions in dealing with the prevention and control of transmissible diseases of live stock, including poultry.

It is impossible for me to present the individual opinions of various eastern state sanitary officials in referring to Bang's disease in relation to imported cattle. I do not presume that this presentation will express the attitudes of the different states on this subject. However, the various eastern state officials were consulted by letter and this discussion, I believe, will give a general aspect of their opinions.

PURPOSE OF CONTROLLING THE DISEASE

Let me get squarely before you the fact that the prevention and control of transmissible diseases of live stock has a two-fold purpose. First, their relation to public health and second, their great economic importance. Therefore, whatever is done or left undone in the matter of effective prevention and control of these diseases will have an effect upon the public as a whole. Thus, the question becomes one of great national public importance and, as we view it, properly within the regulatory scope of the states and the federal government.

This brings us to the subject of our discussion, namely, "Bang's Disease in Relation to Interstate Cattle." I want it understood that what I say on this subject is with sincerity and emphasis. Comparatively few of the eastern states breed and raise enough live stock to supply their needs. For this reason, many of these states are obliged to bring cattle in from other states in sufficient numbers to meet their local requirement and some eastern states import thousands of head, especially dairy cattle, to supply the great eastern markets with dairy products. The live stock regulatory officials of the eastern states have much concern and grave responsibility over the health of imported live stock, for the reason that transmissible diseases usually go hand in hand with traffic in live stock and on account of the prevalence of Bang's disease in most exporting states and especially the methods in vogue in some states for handling cattle which fail to pass the blood test for Bang's disease.

Laws and regulations governing the movement of live stock, including poultry, for transmissible diseases, should be designed

foremost and specifically to prevent and control those diseases. Such laws and regulations should never be promulgated unless and until they become necessary from a disease prevention and control standpoint. Moreover, such laws and regulations should never be promulgated to promote commercializing in live stock or for any purpose whatsoever except to prevent and control diseases.

NECESSITY FOR INTERSTATE REGULATION

All will agree that laws and regulations are necessary to prevent and control the traffic in diseased animals and thus safeguard the health of our herds and flocks.

The right of a state to regulate the movement of live stock within its confines is unquestioned. Differences of opinion may exist, however, concerning the jurisdiction of the states over the health of live stock as it moves interstate. Federal court decisions, we are informed, place the jurisdiction over the movement of live stock interstate wholly under the federal government and restrain the states from control over the movement of live stock into the states. In other words, the U. S. Department of Agriculture, according to these decisions, alone has jurisdiction over the movement of live stock from the state of Indiana into the state of Illinois. Furthermore, Illinois has no authority until after the live stock arrives at destination in that state. Regardless of such court decisions, however, practically every state in the union has promulgated regulations in which they undertake to prescribe the conditions under which live stock may enter that particular state. As we have indicated, many of these state regulations are in conflict with the decision of the federal courts; also with the federal regulations. Moreover, few of the state laws and regulations are uniform one with another.

While considerable conflict exists between the various state and federal live stock requirements and federal court decisions, we believe that the states are justified in attempting to enforce state laws and regulations designed to protect their herds against Bang's disease infection from other states, at least until such time as, first, the federal government adopts adequate measures to do so and, second, the state live stock regulatory authorities not only take adequate measures to control properly the movement of animals affected with Bang's disease within their respective states, but to make sure that only healthy animals shall be exported.

To illustrate: Twenty-eight cattle certified negative to the

blood test by the official of the state of export, upon arrival at destination, were added to a large native herd which consistently tested negative for two years. After an interval of ten months, the entire herd was blood-tested and five of the 28 imported cattle failed to pass. All of the animals in the original herd, however, passed a negative test. Another state reports that a carload of cattle blood-tested by a practicing veterinarian in the field and originating in the same state as the 28 head just mentioned, upon arrival at destination were retested. Blood specimens were obtained the day after arrival and seven of the animals gave positive reactions to the test. These animals were retested 60 days afterward and gave the same reaction. These two shipments mentioned were exported from the same state, which is one of the largest exporting states, yet is considered lax in its methods for handling reactors to the blood test. Additional similar experiences could be given.

At this point, I want to emphasize again what I said before this Association in 1928, namely:

Any plan devised for the effectual control and eradication of Bang's disease or any other transmissible disease must of necessity regulate the handling of infected animals.

Bang's disease is due to a specific cause (*Brucella abortus* Bang) which may be transmitted from one animal to another. In other words, every case of Bang's disease comes either directly or indirectly from another case of Bang's disease. This fact makes Bang's disease clearly a disease which should come in the class of diseases controlled by regulating the movements of infected animals. No state can consistently object to or justly criticize a sister state for refusing to accept its cattle without suspicion and rigid restrictions as long as it does not require suspects or reactors to the blood tests to be slaughtered or properly segregated and safely quarantined.

ATTITUDE OF THE EASTERN STATES

With few exceptions the eastern states do not raise sufficient cattle to supply their requirements. As a result, thousands of breeding, dairy and feeder cattle must be imported annually. An eastern state official reported that his state imports annually 25 per cent of its cattle population. Another eastern official informed us that his state imports approximately 1,000 dairy cows per month for herd replacements. The federal government has thus far not promulgated any regulations on Bang's disease, whereas 41 states have taken action and adopted regulations covering this disease in imported cattle as follows: Twenty-nine

states require a negative blood test, twelve states forbid the importation of cattle that are positive to the blood test or have aborted, while the remaining seven states have no regulations.

The following eastern states have promulgated regulations requiring a negative blood test on imported dairy and breeding cattle: Delaware, Maryland, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Virginia and West Virginia.

The live stock regulatory officials of the ten states mentioned are united in the opinion that a negative blood-test requirement on imported dairy and breeding cattle is a necessity for the protection of the health of their native herds. While the following states do not require a negative blood test on imported cattle, they do prohibit the bringing in of animals that have reacted positively to the blood test for Bang's disease or that have aborted: Connecticut, Maine, Massachusetts, New Hampshire and Rhode Island. Vermont has no regulations. Three (50 per cent) of these last-mentioned six states export more cattle than they import. Their export cattle go largely into the three states which have no blood-testing requirements. However, the officials of practically all of the six states are of the opinion that a single blood test on imported cattle is not sufficient protection and that additional tests should be required.

The following statement made by an official of one of the eastern states, and which state has not as yet made a blood-test requirement for incoming cattle, expresses the viewpoint of most of the regulatory officials of the eastern states:

The time is probably close at hand when importing states should adopt more stringent regulations against Bang's disease, but we believe there should be concerted action among the states as much as possible.

Another eastern state live stock sanitary official wrote as follows:

We do not consider a single negative test of much value as a safeguard unless it is positively known that the animal has not associated with infected cattle. It is, however, a common practice and error to buy non-reacting cows from herds where there are reactors.

INTERSTATE REGULATIONS

It should be the purpose and duty of a state live stock regulatory organization to procure and enforce laws and regulations that will adequately protect the live stock of the state against transmissible diseases from other states. In other words, a state is justified in promulgating and enforcing such regulations as will cause economic live stock production and public health

protection by preventing the spread of a disease from one herd to another whether within or from a herd outside of the state.

The eastern states are expending large sums of public funds annually in preventing and controlling Bang's disease in their native herds. It is false economy and the height of folly for them to continue these expenditures unless they provide adequate protection against Bang's disease from other states.

About three years ago, while attending a veterinary meeting in a midwestern state, in discussing Bang's disease, I stated:

If this particular state does not change its method of handling reactors to the blood test, it will mean that other states will embargo against it.

To this, one of the officials of the state to which I refer replied:

Well, let the states quarantine against us, for their so doing will force our dairymen and breeders to support a change in our state policy for handling reactors.

It was our opinion and we so stated that theirs was a weak and vacillating policy for any state to follow, especially a cattle-exporting state, and would eventually plague them. Our foregoing prediction has come true.

In a paper read before this Association in 1928, our suggested Bang's disease regulations were presented.* These proposed regulations were the basis for the present Pennsylvania Bang's disease regulations on imported cattle and are substantially the same as those adopted by most of the other states. The weakest feature in these regulations is that they first provide for but a single blood test and, second, make no provision for health history of the herds in which the tested cattle originated. By health history we mean the status of the herd from a previous blood test of all animals in the herd.

Speaking on this subject before this Association, in 1930, Dr. R. R. Birch had this to say:

I am speaking of the individual test, which ignores the status of the herd from which the animals are purchased. If any one thinks he can go into some distant state and buy mature animals on individual test and keep them testing clean, he will change his mind after he tries it a few times. It just can't be done as a routine practice. We really must know three things if we are going to use the agglutination test successfully in the purchase of cattle. We must know the status of the contact animals in the herd from which the animals came. We must know, of course, how the transferred cow herself tests and then we must know the status of the herd into which she is introduced.

We fully indorse Dr. Birch's statement. A single blood test is not considered sufficient insurance that the animal is free

*Munce, T. E.: Bang disease from a regulatory standpoint. Jour. A. V. M. A., lxxiv (1929), n. s. 27 (4), pp. 622-630.

from infection of Bang's disease, yet it is a step in the right direction and furnishes a protection in many cases. A more ideal regulation is one that requires all imported dairy and breeding cattle to come from Bang's disease-free certified herds. However, in this connection, the standards of certification should be the same in all states. This suggested ideal interstate regulation is needed at the present time and the aim should be to approach it as fast as the conditions in each state will permit.

UNIFORM REGULATIONS

Interstate live stock regulations should be uniform, one state with others. The success of a regulation depends largely upon the support it receives from the public. The more concisely and clearly a regulation is drawn, the easier it is to understand and the better will it be supported by the public.

Bang's disease is the same disease in each state, and the interests of the owners and general public are or should be similar. Numerous advantages could be pointed out for having uniformity in the interstate Bang's disease regulations of the various states. On the other hand, do you know of any good reason why such regulations should not be uniform?

ATTITUDE OF LIVE STOCK OWNERS

The interest among owners of live stock in the prevention and control of Bang's disease and establishing Bang's disease-free herds, has gone forward faster than was anticipated by even the most enthusiastic and optimistic advocate of this line of work. In this respect, cattle-owners as a class have excelled the veterinary profession and especially the practitioners. Owners for economic reasons are seeking relief from the losses incident to the prevalence of Bang's disease in their herds. Owners are becoming more and more convinced that their only hope lies in the blood test, elimination of reactors, good sanitation and preventive measures. Thus the demand for adequate interstate regulations as a preventive against Bang's disease has been made largely by the owners themselves. Breeders in Pennsylvania are now demanding more stringent regulations as indicated by resolutions by breed associations. Only the states which avoid compromise methods and insist upon safe and sound disease control practices need expect to find a ready market for their surplus cattle in the eastern states.

As pointed out, interest in Bang's disease prevention and control on the part of owners is rapidly increasing, yet too many owners continue to be indifferent toward this preventable and

wasteful disease. Such indifferent owners, instead of seeing to it themselves that the cattle they buy are free from Bang's disease, place this responsibility on the state regulatory officials. Will Rogers told the truth in a jest when he said:

You know the people kinder look on our government to tell 'em and advise 'em.

As one eastern state official has put it:

Surprising but true; seldom does the average dairyman, when buying a cow, make inquiry concerning the animal's possibility of having abortion disease.

There are many owners who show an interest in the elimination of Bang's disease by way of compromise and soothing methods. In advising such owners, the regulatory official and local veterinarian should be frank and honest rather than yielding and vacillating.

If more cattle-owners and veterinarians would apply the principles and preventive measures which are available for effectively controlling Bang's disease, and some regulatory officials would be less yielding in connection therewith, the necessity for interstate regulations would be materially lessened.

The practicing veterinarian plays an exceedingly important part in the prevention and control of Bang's disease. A veterinary practitioner who is properly interested and well informed in the principles and methods of Bang's disease prevention and control, and will correctly advise his clients, be they dairymen, cattle-breeders or dealers, can do more perhaps than any other person in his community in the promoting of Bang's disease-free herds. On the other hand, a practicing veterinarian who is indifferent, careless or unscrupulous in giving advice or performing his work in connection with Bang's disease, is just as detrimental as is the careless, indifferent or unscrupulous cattle-owner, dealer or regulatory official.

CONFIDENCE IS ESSENTIAL

Complete confidence between the states and all others concerned will accomplish more than any other one thing toward simplifying and unifying interstate regulations. The best way, in fact the only way, to bring about this complete confidence, is for all stockmen, dealers, veterinary practitioners and regulatory officials to execute honestly and efficiently every phase and detail of the procedure which is theirs to perform in order to breed, raise, sell, transport and otherwise handle healthy animals. When honor, honesty and efficiency become universal among the groups I have mentioned, confidence will replace suspicion and

there will be no necessity for a multiplicity of interstate live stock requirements and no occasion to appeal to courts to nullify state regulations deemed necessary under the prevailing unsatisfactory relationships, misunderstandings and lack of confidence.

CONCLUSIONS

1. The states, especially cattle-importing states, have ample justification for promulgating and enforcing necessary regulations to provide adequate protection to their native herds from Bang's disease infection from outside sources.

2. All states should segregate and properly quarantine, until slaughtered, all animals that fail to pass a satisfactory blood test for Bang's disease. This practice would be especially advantageous to exporting states. By so doing, they will not only be safeguarding the health of their native herds, but instilling confidence in the minds of the cattle-buying public and regulatory officials in the states of destination.

3. The lack of uniformity in interstate Bang's disease regulatory requirements is confusing to stockmen, regulatory officials, practicing veterinarians and transportation companies and a hindrance to the control work. This objection should be removed as soon as possible.

4. A single blood test is not considered a sufficient safeguard again Bang's disease on interstate cattle.

5. The states should strengthen their interstate Bang's disease regulations as indicated by existing conditions.

6. The suggested ideal interstate Bang's disease regulation is needed at the present time and the aim of the state should be to approach it as rapidly as conditions in each state will permit.

7. Bang's disease regulations should be promulgated primarily for the purpose of preventing and controlling this disease. They should never be promulgated for commercial purposes.

8. Herd certification standards should be the same in the different states if regulations requiring animals to come from certified herds are to become effective in the different states.

9. More herd-owners should take greater interest and assume more responsibility in the health of the cattle they buy. Owners themselves are directly and adversely affected in the purchase of cattle infected with Bang's disease. It is bad business and unfair on the part of owners to place all responsibility for the health of their cattle on the regulatory officials.

10. All veterinarians whose actual or potential clients breed,

raise or deal in cattle should become interested in and familiar with the principles and methods available for the effective prevention and control of Bang's disease. They should also give their full coöperation to the regulatory officials in the enforcement of both the interstate and intrastate regulations.

11. The regulatory officials should attach more importance to the close supervision of herds, the collecting and testing of blood specimens, careful checking of animals in order to identify correctly those tested and for which certification is to be made, and the Bang's disease status of herds from which cattle are sold as the result of previous blood tests.

12. Honesty, integrity and efficiency on the part of all who participate or enter into the breeding, raising, selling, testing, certifying or other handling of live stock makes for confidence between the seller and buyer, as well as regulatory officials. Confidence in turn is essential to a healthy and profitable live stock industry and the free movement of live stock between the states.

PRESIDENT MALCOLM: The next on the program will be a paper by Dr. C. R. Donham, University of Minnesota, Saint Paul, Minn., "Some of the Things We Should Recognize Concerning the Agglutination Test for Bang's Disease." (Applause)

. . . Dr. Donham read his paper. . . .

SOME OF THE THINGS WE SHOULD RECOGNIZE CONCERNING THE AGGLUTINATION TEST FOR BANG'S DISEASE*†

*By C. R. DONHAM, Saint Paul, Minn.
University of Minnesota, University Farm*

No informed person claims that the agglutination method, or any other similar diagnostic procedure, is 100 per cent efficient. There are certain facts available which give us an estimate of the reliability of this test as it is being used in the diagnosis of Bang's disease. This test has been the subject of considerable controversy and difference of opinion. It appears that a major part of this controversy is entirely unnecessary and could be avoided readily if we were all sufficiently interested in eliminating it. In other words, it seems that this test could be conducted

*Some of the researches upon which this paper is based were made possible by a grant from the Bureau of Animal Industry of the United States Department of Agriculture.

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much more efficiently than now. However, even as the test is being used at present, it is highly efficient.

The remarks in this discussion refer to the test-tube method of agglutination testing except where the rapid test is specified.

This test is based on a quantitative measure of that substance in the blood-stream which we call agglutinin. The test must be on a quantitative basis for the reason that not all animals that carry agglutinin for *Bacterium abortus* in their blood are infected. The dilutions employed in conducting this test are purely arbitrary and are not the same in all laboratories. Other dilutions might have been adopted, but experience has taught us that the range of dilutions which is employed is suitable for diagnostic purposes. There are sera which agglutinate the antigen in certain of the dilutions but not in the others. Therefore, it has been necessary not only to establish a range of dilutions but also to define certain arbitrary standards for interpretation of agglutination titres into negative, suspicious and positive diagnoses.

Variations in the technic of preparing the test fluid and in conducting the test result in differences in agglutination titres. A great deal has already been accomplished to minimize this source of difference in the results obtained by the various laboratories. This Association has adopted a standard technic for conducting this test. The conference of Official Research Workers in Animal Diseases likewise has adopted essentially the same standard technic. This standard may be revised when better methods are made available. It is founded on carefully conducted experiments and is backed by a majority of the workers who are responsible for conducting this test. However, there is still room for improvement in this regard. Some workers have refused to adopt this standard technic. They contend that their own methods are superior, in their hands, to those that have been adopted by this Association. This is possibly true but in the interests of uniformity there is an urgent need for the universal adoption of one standard. The states that are not complying with the adopted standard technic are complicating the situation and hindering progress toward uniformity of results obtained by different laboratories.

Progress in the attempts to standardize the technic in various laboratories is necessarily slow. Laboratory workers and research men are a stubborn lot, all inclined to prefer their own technics. They must be shown and not merely told that they should change their methods. While this attitude often causes unnecessary delay and consequent impatience on the part of

those dependent on the laboratory for aid in diagnosis, it should be stated that an investigator should not discard the old until the new has demonstrated its superiority.

It has been shown, by adequate experiments, that the thing which has made it possible to use the agglutination test, with a high degree of efficiency for the control of Bang's disease, is a matter of percentage of animals that have the various degrees of agglutination content in their blood. A vast majority of the animals that are being tested give almost uniform results from the standpoint of diagnosis in all laboratories. This group includes approximately 75 per cent that are negative and 20 per cent that are positive. This leaves about 5 per cent of the animals in the suspicious group that do not give the desired uniformity of results in the various laboratories. These animals are the cause of most of our troubles and differences in results in conducting this test. Hence we see that the redeeming feature of this situation rests in the fact that only about 5 per cent of the animals have a low to medium agglutinin content.

This fact has not been emphasized sufficiently and as a result it has not received general recognition. The published reports of comparative tests by coöperating laboratories have tended to create an erroneous impression on this point. This is because in such comparisons the sera have usually been highly selected with a relatively large percentage having a low to medium agglutinin content. This has been necessary in such studies because these are the only sera which provide the workers with comparisons that will detect differences in their results. The negative and positive sera usually give uniform results and are not, therefore, of much value in such comparisons.

The percentages of animals that are given as negative, positive and suspicious are estimates based on the published results obtained in various laboratories. There is a surprising and pleasing agreement on this point. However, it must be remembered that these classifications are arbitrary. It is likely that if we were doing area testing for Bang's disease, the percentage of infected animals would be lower. If so, the percentage of suspicious animals would likewise be lower and the percentage of negatives would be higher. This proportionate increase in the number of negatives would increase the efficiency of the test from a percentage standpoint.

There is a real need for data on the incidence of Bang's disease based on the total cattle population. Very few such data are available. We are attempting a survey to obtain such data by testing all the cattle in certain townships that have been

selected as representative of the various types of the cattle industry found in Minnesota.

With regard to the suspicious group of animals, it is safe to say that there is far more discrepancy in the opinions of various workers regarding the proper disposition of such animals than there is in the results of the test itself. For example, New Jersey will not admit cattle having a titre of 1:25, while Minnesota and some other states do not even use this low dilution in routine testing for Bang's disease. Results of considerable research work with suspicious animals are available but apparently not enough has been done definitely to establish the proper condemnation titre. Further investigations on this point are in progress in several different laboratories, but the resulting data are sometimes confusing because the standard technic of testing is not universally employed. For example, one laboratory may report that *Bact. abortus* was isolated from a number of cows having a maximum titre of 1:100. Other workers repeatedly fail to obtain the bacteria from animals with this titre according to their tests. Further investigations, at times, have shown that the agglutination titres obtained in the two laboratories were sufficiently divergent to explain the differences in the results of their bacteriological examinations. The research men, as well as the control men, are badly in need of the universal adoption of standard methods of testing.

There are two schools of thought regarding the proper disposition of suspicious reactors. It should be clearly understood that in this connection we refer only to those animals that have a reasonably constant low agglutination titre of 1:25 to 1:50, or even 1:100 in some cases. Animals having a rising titre are not included, of course.

One group of workers emphasize the fact that the indiscriminate condemnation of low-dilution reactors is sure to eliminate many animals that are not infected and are not dangerous to other animals. In fact, some workers feel that many such cattle are even more valuable for some herds than completely negative animals. These men consider the practice of condemning all low-dilution reactors as wasteful to the extent that it should not and probably will not be tolerated by the cattle industry.

The other group of men feel that some low-dilution reactors are carriers and potential spreaders of the Bang organism. They feel that it is better to condemn a few too many animals and be safe than it is to try to conserve the suspicious animals and take chances of leaving a spreader in the herd. They argue that, on the average, the cattle-owner can better afford to gamble

on 75 negative animals rather than to keep 80 negative and suspicious animals. They contend that, if the owner keeps the suspicious animals, in effect he is gambling five such animals against the health of his 75 negative animals.

There can be no argument that the elimination of all animals that show agglutination in any dilution is a safer policy, but it is at the same time a wasteful policy. If, on the other hand, the leaving of suspects in the herd results in additional reactors, then of course this policy becomes more wasteful than the other.

Our own opinion is that this controversy can not be settled at the present time to the complete satisfaction of all. This is because factors other than a single agglutination test are of so much value in the intelligent handling of suspicious cases. Much more emphasis should be placed on the value of repeated tests of suspicious cases and on the numerous other available aids in determining the disposition of such animals. Each case deserves individual consideration. Entirely too much dependence has been placed on single tests by some workers. Some veterinarians can and do repeatedly leave selected suspects in negative herds without any bad results, but in selecting such animals they consider many things other than a single agglutination test. On the other hand, where the control measures consist solely or chiefly in testing the animals and recommending the elimination or segregation of reactors, the practice of leaving low-dilution reactors in the herd often results in disaster. There is a great deal more to the job of successfully controlling Bang's disease than the mere testing of cattle. Low condemnation titres are undeniably safer, but we must not attempt to substitute such condemnation titres for other aids in the control of this disease. It is not fair to place the blame for all failures on the agglutination method. The test is merely an aid, without any imagination, and should not be entrusted with powers that belong to the veterinarian and not to the test.

There are, of course, some errors in the results of this test which are due to labeling and other clerical procedures in collecting and testing blood samples. In well organized work such errors are not sufficiently numerous to defeat the object of the test.

The agglutination test for Bang's disease has some limitations. An understanding of these is necessary to its proper and intelligent use. It must be remembered that animals do not show positive reactions to the test immediately after they become infected. The period of incubation before agglutinins can be demonstrated is variable. They usually appear within

three to four weeks after infection occurs. However, in some cases infected animals do not show a positive test for longer periods of time and occasionally not until after the termination of pregnancy. A negative test is, of course, no assurance that a subsequent infection will not occur. Too much dependence should not, therefore, be placed in a single negative test of the individual animal.

As in tuberculosis, a few infected animals do not show a positive reaction to the test. Such animals have not been found to be sufficiently numerous to defeat the object of the test as a control measure in either disease.

Some positive animals cease to react after a considerable time. Such animals have not proven to be sufficiently numerous to be of any material value in combating the ravages of Bang's disease. The existence of these animals is unfortunate, because they merely serve to build up false hopes in the minds of owners of infected herds. Rarely, if ever, have these animals been the means of returning a naturally infected herd to a healthy and profitable status. Consequently we prefer to disregard the small percentage of such animals and adhere to the policy of once positive, always dangerous.

Very young calves from infected dams usually show positive reactions to the test if they are permitted to nurse their mothers. These reactions have been shown to be due to the ingestion of agglutinins contained in the colostrum. Such positive reactions are false in a way, because they do not always indicate active infection in the calf. If such calves have ingested colostrum which contains the Bang organism, then the reaction to the test may remain positive for weeks or months. Reactions usually disappear before the calf reaches sexual maturity, provided it is only permitted to get the colostrum and the feeding of infected milk is thereafter discontinued.

A positive reaction to the test must not be considered as evidence that the animal has or will abort because this symptom is not always present. A negative test must not be considered as evidence that the animal has not or will not abort because there are other causes for abortions in cattle. Therefore we should be very careful in criticizing the test where negative animals abort.

When these limitations are understood and properly guarded against, they do not seriously interfere with the use of the test as a control measure. We must appreciate that the tuberculin test has its limitations, yet it has been highly efficient in the control of tuberculosis.

The introduction of the rapid or plate method of testing has brought forward other problems. The rapid method appears to have enormous possibilities. We should not expect it to emerge in a perfect state. In the past there has been even less uniformity in the rapid method than in the test-tube method. However, the test-tube method has required years of study to arrive at its present state of efficiency. We should be patient, study and develop the rapid-test method so that we may avail ourselves of its maximum efficiency.

An attempt is being made to standardize the antigen for the rapid test by comparing its sensitivity in tests of sera to the results obtained by the test-tube method. This, in our opinion, is wrong in principle. Each of the methods has its elements of error. It is not hard to reason that if one antigen is standardized to the other, the end-product will necessarily include the errors of both methods. Furthermore, the rapid-test method involves some elements of activity that are not perceptible in the test-tube method. The most plausible explanation of the agglutination phenomenon is given in the principles of colloidal chemistry. The rapid and test-tube methods involve entirely different set-ups from this standpoint. Consequently we find that the results of testing by the two methods are not always comparable. That is, it is not at all uncommon to encounter sera having identical test-tube titres that do not give even similar titres by the rapid method.

Thus, if the sensitivity of rapid-test antigen is to be dependent on comparative tests, its sensitivity will be dependent on the behavior of the particular serum samples that are selected for such comparisons. Such a method of standardization of rapid-test antigen cannot result in uniformity because we cannot detect, by the test-tube method, which of the sera are suitable for comparative tests.

The present method of standardization of rapid-test antigens has one very dangerous aspect. It has been difficult to prepare rapid-test antigens that are sufficiently sensitive without the addition of gelatin or some other material having a similar effect. When gelatin is added, the sensitivity of the antigen is increased for tests of most but not all sera. This increase in sensitivity is, in general, in ratio to the proportion of gelatin in the antigen. It is easy to make rapid-test antigen that is far too sensitive even to approximate the results obtained by the test-tube method. Our experiences have taught us that there is a natural tendency for those veterinarians who are not familiar with antigen production, but who are conducting rapid tests, to value antigens accord-

ing to their sensitivity. That is, they tend to consider the most sensitive rapid-test antigen as the best one. Herein lies the danger in this situation. Producers of commercial rapid-test antigen have recognized this—at least some of them have—and quite naturally they have been interested in making their product salable by making it super-sensitive. Some have even expressed the opinion that it is not possible to make rapid-test antigen that is too sensitive. We wish to denounce this attitude emphatically. Remember that the whole system of agglutination testing must conform to some standard. If super-sensitive test-tube antigen is desired, it can be prepared by the addition of gelatin, or in other ways. We wish to warn control men of the danger of authorizing the use of super-sensitive rapid-test antigens.

It should be possible to establish a standard for rapid-test antigen similar to that of the test-tube method and then prepare rapid-test antigens in accordance with this standard. Experiments which are designed to accomplish this purpose are in progress at the present time. Such a standard should give agglutination titres that closely agree with the test-tube results. The agreement would not be perfect. Each test, the rapid and test-tube, has its place. There is no basic reason other than custom and more extensive experience for assuming that the test-tube method is superior to the rapid-test method. The reverse may be found when we know more about the rapid-test method.

In spite of the lack of complete understanding and uniformity in the rapid-test method, our studies have indicated that, as in the test-tube method, nearly all of the discrepancies in the results are confined to tests of sera from suspicious animals. Again the redeeming feature of the situation is the low percentage of such animals.

It may be stated that the agglutination test for Bang's disease is highly efficient as a diagnostic method, but that it would be markedly improved if all workers would accept the standard technique which has been adopted by this Association. At present we have ourselves and not the agglutination test to blame for a major part of the embarrassing situations which arise from the application of this test. In view of the fact that essentially all of our troubles and differences in results arise from tests of a relatively small percentage of the cattle, it seems that we have done entirely too much talking to the laity about the errors. It is time to place more emphasis on the success of this diagnostic procedure. After all, Bang's disease is admitted to be one of the most serious handicaps that the cattle industry has to compete with and the

agglutination test has many times been the means of its successful control. Furthermore, it may be stated safely that control measures based on the agglutination test have been more successful than any other procedures which are now available.

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PEESIDENT MALCOLM: The next will be a report of the Committee on Bang's Disease, presented by the Chairman, Dr. C. P. Fitch, of Saint Paul, Minn. (Applause)

. . . Dr. Fitch read the report. . . .

REPORT OF COMMITTEE ON BANG'S DISEASE

Dr. C. P. FITCH, *Chairman*, Saint Paul, Minn.

Dr. Geo. H. Hart,* Davis, Calif. Dr. W. Wisnicky, Madison, Wis.

Dr. W. K. Lewis, Columbia, S. C. Dr. Chas. Murray, Ames, Iowa.

Dr. W. J. Butler, Helena, Mont. Dr. M. F. Barnes, Harrisburg, Pa.

The past year has provided time for extending and improving the control of Bang's disease. The necessity for such control has appeared very plainly to veterinarians and owners of cattle during the past few years. There is no doubt that the addition of the human health factor has been an additional stimulus toward the adoption of plans for the elimination of this infection, not only from cattle but more particularly from hogs and goats. We desire to stress, however, that the essential thing at this time, as far as the live stock industry is concerned, is that of animal health. Losses from Bang's disease to the animal husbandry of this country still continue to be enormous. These can ill afford to remain, especially under present economic conditions.

Your Committee, six years ago, urged, as a part of the program in the control of this disease, that each state adopt rules and regulations which fitted the conditions existing in its own confines for the control of this infection. At the present time 35 states have definite rules and regulations for the control of the disease. There are 1,679 Bang's disease-free herds located in 29 states. Thirty-two states require a negative test and a health certificate showing results of such test for all imported dairy and breeding cattle. In addition, eight states require that no animal giving a positive reaction to a test for Bang's disease can enter except under special permit. No stronger evidence of the value and significance of these reports need be offered.

Your Committee this year desires to call your attention to some of the previous actions of this Association in respect to Bang's disease, and urges upon the membership the importance of these recommendations, and their adoption by the respective states. Also we desire to make five additional recommendations.

1. Last year your Committee presented a definite procedure for carrying out the agglutination test for the diagnosis of Bang's disease. This procedure was adopted by this Association, and a similar procedure was presented to the Conference of Federal and State Experiment Station Workers in Animal Diseases, where it laid over for one year. This year that Conference has adopted such procedure as standard technic with the addition of the 1:25 dilution. We recommend that animals giving a complete agglutination at 1:25 or an incomplete

*Acting for Dr. C. M. Haring.

reaction at 1:50 be regarded as suspicious. It is highly important that uniform methods for the conduct of this test be generally used. Some of the embarrassing situations in which cattle-breeders find themselves today are the direct result of lack of attention which certain states are paying to laboratory procedures for the diagnosis of this infection.

2. Your Committee three years ago stated:

The use of living vaccines which are virulent or which may become virulent is a dangerous procedure. We recommend that their distribution be prohibited. This is stated not only because of the relation of the use of these products for the control of the infection in cattle and other species of live stock, but because of the added danger of the transmission of the infection to human beings by their use. We do not imply by this that vaccination as a method for the control of Bang's disease is still worthy of study. We do state most emphatically, however, that it is still in the experimental stage and should be kept under close supervision of competent research specialists.

This same situation prevails today.

3. With 40 states having regulations regarding the interstate movement of cattle which react to the agglutination test for Bang's disease, and furthermore, recognizing the vast differences which exist in such regulations, and their consequent ill effects upon the cattle industry, we most earnestly recommend that the Bureau of Animal Industry of the U. S. Department of Agriculture take under consideration these various regulations, and establish uniform interstate rules in respect to Bang's disease for the shipment of cattle, in a manner similar to their action on the interstate movement of cattle for tuberculosis contained in so-called regulation 7.

4. We believe that all tests for Bang's disease should be reported to the live stock sanitary authorities of the different states, and that these authorities should take cognizance thereof. It is highly important that only competent individuals perform or carry out tests for Bang's disease, and that the results of such tests be carefully considered by those in charge of animal health. It is highly important that reactors to the agglutination test for Bang's disease be identified, to aid in the regulation of traffic in such individuals. It is also very important that only those individuals who are not only competent but trustworthy be allowed to conduct the test for this infection.

5. We desire to recommend the following uniform rules for interstate movement of cattle:

a. Bang's disease regulations should apply to all dairy and breeding of cattle and those which contact the same, with the exception of certain range cattle.

b. Cattle should originate either from Bang's disease-free herds or pass a negative agglutination test for Bang's disease within thirty days prior to shipment.

c. Tests shall be carried out by an approved agency in accordance with the technic adopted by this Association. The results of the tests shall be stated plainly on the health certificate, and such certificate must be approved by the proper live stock sanitary official of the state of origin.

d. Provisions should be made by the state promulgating Bang's disease regulations to enable cattle, which do not pass the test, to enter on special permit whenever proper conditions can be provided.

e. Cattle entering on health certificate having an unknown origin, and entering clean herds, or herds in the process of becoming free, should be quarantined at destination, and required to pass a negative retest not earlier than 40 days following the receipt. It would be most desirable if a retest be made not less than 21 days following parturition.

6. We desire in particular to call to the attention of those states

which require a test for animals entering, and which do not have rules and regulations for Bang's disease, that it is highly dangerous to place disease-free animals in herds which possibly are infected with this disease. These individuals are very apt to become infected and light up a storm of abortions which may spread to the entire group. Blame in these instances is often attached to the imported animals when actually the fault lies in the dormant disease in the herd.

7. Finally we are not recommending uniform methods for the control of the disease within the state. We are firmly of the belief, however, that it is absolutely necessary for the states to establish such plan for the benefit of the cattle-owners of their respective commonwealths. These plans should conform to their local conditions, which are quite variable. We desire in particular to warn against any unusual restrictions on the movement of cattle within the state. Regulations should be reasonable, practical and consistent with the progress in the control of this disease. Basic knowledge of the methods of spread and channels of infection of Bang's disease is available. This should be incorporated in any plan, the object of which is the proper control of this infection.

DR. FITCH: I move the adoption of the report.

DR. W. J. BUTLER: I second the motion.

PRESIDENT MALCOLM: You have heard the motion. Is there any discussion?

MR. E. F. RICHARDSON: I am not a professional man but I have sufficient knowledge to recognize the value and importance of the report, and I should like to see a copy placed in the hands of each state official, irrespective of the minutes of the meeting. I will amend the motion to include that a copy of the report be sent to each state official.

DR. BUTLER: I second the amendment.

PRESIDENT MALCOLM: There is an amendment before the house that a copy of the report be placed in the hands of state officials. What is your pleasure?

DR. A. W. MILLER: I understand that one recommendation Dr. Fitch made was that the Bureau of Animal Industry promulgate uniform regulations governing the interstate shipment of cattle, with reference to abortion disease. Is that correct?

DR. FITCH: Yes.

DR. MILLER: I think most of you know the position of the Bureau of Animal Industry at this time, with reference to that particular phase of the question. In passing, I may say that I do not intend to oppose this recommendation, because it is merely a recommendation, but I am wondering, as a matter of policy, if it is a good thing for the Association to go on record to that effect at this time. You all know that any measure is only as effective as the machinery that you have to put it in operation.

We have no machinery at this time. We have no money available, that is, to any extent, that could be used. I think you all know that with the present temper of Congress it would simply be out of the question to obtain an appropriation.

I know also there are certain live stock interests that feel at the present time they are burdened with all the regulations they can stand. I am not sure but that it would be better to defer any recommendation of this kind at this time rather than to adopt it.

DR. W. E. COTTON: This particular paragraph of the report would certainly place a pretty big burden on the Bureau of Animal Industry,

and, as Dr. Miller has pointed out, the machinery is not available to carry it out. If it is a regulation that cannot be carried out, it is better not to put it over.

Dr. Donham, in his paper, pointed out, I think, that five per cent of the animals that were tested reacted in a low titre as suspicious. They were ones about which there might be some doubt as to where they should go. That was five per cent of the total number of animals tested, as I understand it. About twenty per cent of the animals reacted in some way. I wish you would keep that in mind. It makes the thing a little bit different.

There is another thing that I cannot agree with. Our work does not support it, and the work of a good many other investigators does not support it. That is the statement made in Dr. Donham's paper that "once a reactor, always dangerous." I don't believe that is supported by the work of a good many investigators. That test needs to be worked on a little more; Dr. Fitch and his associates are working on it. Possibly in another year or two he will be better able to take up the question.

You must bear in mind that for regulatory purposes you want something that is pretty definitely going to tell you whether an animal has the disease or has not the disease. The agglutination test is a most excellent test for trying to rid herds of the disease, but it is not a test that tells definitely whether an animal is infected or not.

. . . The question was called for. . . .

PRESIDENT MALCOLM: You have heard the amendment. Those in favor, say "Aye"; opposed, "No." The "ayes" have it. The amendment is adopted.

MR. A. J. GLOVER: I should like to know the attitude of the Bureau of Animal Industry concerning the report of this Committee. Why shouldn't the report be adopted, even though the Department has no money? Is that any reason why it should not be adopted? Let's get the money if it is important to the live stock industry.

DR. MILLER: I shall try to make our position just as clear as I can. It is not particularly a question of money; it is a question that many of the live stock people of this country think they are burdened at this time with all the regulations they can stand; in fact, some of them have expressed the opinion to us that if the sanitary interests of the country are going to continue to urge amplification of regulations, they are not only going to oppose that but they are going to oppose some of the appropriations we now have available for carrying on worthwhile work.

I merely raised this question as a matter of policy: Is it wise at this time to go on record as favoring this particular recommendation? I was only raising a question in regard to that one item in the report.

MR. GLOVER: What item?

DR. MILLER: That the Bureau of Animal Industry should promulgate uniform regulations governing the interstate shipment of cattle with reference to abortion disease. That is the only question I raised. I said in raising it that I did not intend to oppose it, but I think you people should have your eyes open as to the situation that confronts the Bureau of Animal Industry at this time, simply as a matter of policy.

MR. GLOVER: The live stock industry is confronted with a rather serious problem. There are several of our states where no animal can be imported unless it comes from an accredited Bang's disease-free herd. In other words, we may test the animals to be shipped into this state; they may be negative, but the state will not admit them.

Whether that is right or wrong, it is preventing the sale of a great many cattle in a number of states that have cattle for sale.

It was stated in the report that, when you send a disease-free animal into a herd with abortion disease, you may have a flare-up of the disease, not due to the shipment of the animal but taken from an animal in which the disease has been dormant. In other words, the question comes before the live stock industry and before the purchasers of cattle, isn't it better to put a positive animal into a herd with infection than to put into it a disease-free animal?

I think it is time for the Bureau of Animal Industry to point out regulations that are fair to the stock-raiser, fair to the state in the shipping of animals with or without abortion.

Dr. Donham said that "once a reactor, always dangerous." That does not conform with the findings of the Wisconsin Experiment Station. Forty-two animals were purchased some years ago for carrying on an experiment. They were all negative to the test and remained negative for about a year or more. They were all infected, artificially and by the usual contact with diseased animals. Thirty-nine out of the forty-two became positive. There were three animals they could not make positive to the disease, no matter what they did. Time went on, and twenty-six of the thirty-nine became negative to the test.

About a year or more ago a portion of the twenty-six became useless as milkers and were sent to the butcher, but quite a number of them were still in the herd and were allowed to mingle with clean animals to determine whether once a reactor, always a reactor, or whether these animals would be dangerous and transmit this disease. "Have they given a single one of these checked animals the disease?" It is pretty good evidence, at least we think so. I belong to the committee that is planning the experiment. A couple of weeks ago we had a meeting regarding it. They feel it is perfectly safe, that after an animal has been a reactor and then becomes negative to the test, she is free from the disease and she is safe to mingle with other animals. If that be true, isn't it essential that the Bureau of Animal Industry promulgate a set of rules that would be fair to the industry and would be helpful in the eradication of Bang's disease?

DR. N. S. MAYO: It seems to me that the question before us now is whether in the opinion of this Association it is desirable to recommend to the Bureau that some steps be taken to establish some sort of protection for the interstate shipment of cattle. That seems to be the only problem before us now. It seems to me that we should take such action as we deem wise in this matter, without reference to whether it can be put into effect afterwards or not. That is up to the Bureau of Animal Industry.

DR. LEO F. RETTGER: We have heard the two extremes. I believe exactly what Dr. Donham has said. In Connecticut we have claimed for fifteen years that once an animal is a confirmed reactor, she is nearly always a permanent reactor. What I mean by "confirmed" is an animal that has been infected, or a group or herd, naturally or artificially. There are reactions in those animals, some of them stronger than others. Sometimes there are reactions in young calves. We would not say that in a young calf that reacts, the reaction would be permanent. We know the reaction will not be permanent. It disappears by the time the animal is five, six or seven years old. The same thing must be true in herds or groups of animals that have been artificially infected. There is a fleeting, immediate response. Whether that is a deep-seated infection or not, it seems to me it is only after there is a readjustment of the host to the infecting organism. After that readjustment, the animal is going to be positive or negative.

If Dr. Donham means an animal, on two consecutive tests, not too far apart, is distinctly positive, I agree with him to the extent that I would say a confirmed positive nearly always is positive. We have worked on that phase for some fifteen years, but you must be sure to define what you mean by positive.

DR. C. R. DONHAM: I object to the implication that I stated that all positive animals always remain positive. On the contrary, it was stated that some animals ceased to react to the test. It was stated also that these animals had not been of any material advantage in combating the ravages of this disease, and it was stated that we preferred to adhere to the policy of "once positive, always dangerous," disregarding the small percentage of such animals that do become negative under natural conditions.

DR. MAYO: Mr. President, I arise to a point of order. We are discussing the adoption of this report and not the papers that have gone before. We are likely to confuse the whole problem if we go into a discussion of the whole question. I think we should take action on the adoption of the report, and the discussion should be confined to that report.

DR. B. J. KILLHAM: Concurring with Dr. Mayo that we are getting away from the subject at hand, personally I am a little confused as to the wording of the one particular statement in that report, to which objection has been made. Would it be out of order to ask that that statement be re-read?

. . . Dr. Fitch read recommendation 3. . . .

DR. WALTER WISNICKY: Mr. Chairman, the very reason advanced by the speaker for the Bureau of Animal Industry that we already have too many regulations and that they are harassing the live stock industry is the reason that the Bureau of Animal Industry should take an interest in this matter.

We have 40 states with regulations of various kinds, providing certain requirements, and the live stock interests are in a state of mind now that they do not know just where they are; they are in a state of confusion.

Let me draw a picture for you. Recently a regulation by a certain state went into effect on October 1. There are some 1,600 herds that are certified as negative to Bang's disease in the entire United States. That state ships in approximately 20,000 cattle annually, and still it provided a regulation saying that no cattle will qualify for that state unless they originate from a Bang's disease-free herd. They import 20,000 cattle. What does it mean?

One certain state shipped to New York 12,000 cattle annually, up to October 1. After October 1 it had not shipped a single animal. There is an exclusion measure, interfering with interstate commerce. They knew they could not get those cattle, and that is why the regulation was promulgated. It was not promulgated for the purpose of protecting live stock health. It was promulgated for the purpose of securing an economic advantage.

There, gentlemen, is a serious thing for live stock sanitary work in the United States. When you try to secure economic advantages, sailing under the banner of live stock regulations, you are prostituting the thing that has been protecting the various states against the dissemination of disease. Not only that, you are ruining a business that it took many years and an enormous investment to establish.

Let us go further into this picture. The state that promulgated that regulation says: "You cannot ship cattle that will pass a negative test." Or they may come back and say, "Some of the cattle that were shipped did not show a negative test." But we can answer that. If

they had coöperated just a little bit they could have gotten just what they wanted. If they had the dealers come to other states with an earnest desire to get clean cattle, they could get them. There is no question about that. They can get cattle that will pass a negative test for Bang's disease.

What will they do with the clean cattle when they get them into New York State? Their own authorities admit their own state is well seeded with Bang's disease just as well as other states that have an intensive dairy or cattle industry. But they say, "No, you cannot bring these clean cattle in to pollute our herds which are infected." That is what they say. What do they say further? They say, "You go to the Adirondacks and up into northern New York where we have a lot of abortion and tuberculosis. You can take cattle without any test and put them into these herds as replacements, but don't accept cattle from other states." There is a preposterous situation, and the live stock interests of the country are getting to realize that these regulations are a mere joke, and they do not put any confidence in them. That is why you have so much lack of integrity. It is time for the Bureau of Animal Industry to do something. If they haven't the money, I agree with Mr. Glover that we will help them get the money. (Applause)

MR. CHARLES L. JOHNSON: One point comes to my mind in regard to asking the federal government to promulgate regulations with regard to the interstate movement of cattle positively infected with Bang's disease. If we ask the federal government to promulgate such regulations we must expect them to make such regulations that will prevent the interstate movement of cattle infected with Bang's disease. There is only one regulation, and that is one that will exclude the animals that are not free from Bang's disease. They cannot go halfway in making these regulations. They cannot make a regulation that will let down the bars to one state and prevent the movement to another state.

It seems to me that if we ask the government to promulgate such regulations, we must be prepared to accept such regulations. I know that my state of Connecticut is not prepared to accept any uniform regulations in regard to the movement of cattle that might be infected with Bang's disease, for the reason that, for your information, the New England States import annually 50,000 head of cattle to replace those that are eliminated by the tuberculosis eradication campaign. It would work an injustice on those which are being tested for tuberculosis if we should place regulations whereby they could not get replacements. I think we are a little too premature in taking this action.

DR. KILLHAM: In view of the clearer view on the section to which objection has been raised, the reason for the objection is not apparent. This organization is in no position to dictate to the federal Bureau, nor is there any desire, as I see, in the Committee report to do so. There is no intention to issue a mandatory edict. The Committee merely recommends that the Bureau consider such regulation. The Bureau is given final authority. If the Bureau considers that at this time it is not opportune to draft and promulgate such regulations, I assume it will be all right with this organization.

DR. FITCH: I cannot speak for the other members of the Committee, but as chairman of the Committee, the interpretation which was made by Dr. Killham is the one which they had in mind. There was absolutely no intent on the part of the Committee to dictate in any manner whatsoever but to recommend that they take into consideration the regulations which are already in effect, or those which may be put

into effect, with the idea in mind, if deemed advisable, that uniform rules and regulations be promulgated.

PRESIDENT MALCOLM: Are you ready for the question? All in favor of the motion to adopt the report of the Committee on Bang's Disease will signify by saying "Aye"; contrary. The "ayes" have it. The report is adopted.

DR. FITCH: I suggest that now is the time to proceed with the discussion of the papers which were presented.

PRESIDENT MALCOLM: I think Dr. Fitch is correct. Therefore, we will have discussion on the papers as they were presented.

MR. A. J. GLOVER: I should like to bring up for discussion the feasibility of permitting positive animals to be shipped from one state to another.

The Committee makes the statement that a clean animal going into a positive herd may be more dangerous than a positive animal going into a positive herd. If that be the case, why shouldn't there be the opportunity to send a positive animal from one state to the other, provided she is sold as a positive animal and is known to go into a herd suffering from infection? I should like to have that debated.

DR. F. H. BROWN: I think all the states are ready for such a move, providing that animal enters branded, so that the person who brought the animal into the state, if he ever decides to sell her, can educate the public to the fact that that brand means it is a positive reactor. I believe we are ready. I see no reason why it should not be done.

DR. FITCH: I should like to call attention further to the fact that that was part of our Committee report, stating that such things should be permitted and that proper regulations be provided.

MR. GLOVER: I have been studying this disease probably as long as any of you, and I never tackled a subject in all my life that has been more confusing than to get a clear, concise understanding of what is the proper procedure in the handling of Bang's disease.

As to the statement that "once positive, always dangerous," I cited the Wisconsin experience with forty-two head. In discussing this matter with some that have cleaned their herds and are now on the accredited list, I find them of this opinion. They said it has been their experience that if the cattle were young and were positive, a great many of them recovered, but if a cow reached the age of three to four years and was positive, they found few, if any, that ever became negative to the test. That has been the experience of several of the breeders that I have talked with who have accredited herds.

There is another thing that is taking place in some herds in Wisconsin. A man owned an abortion herd. He was having a lot of trouble. He made up his mind he would not breed them for a long time, and he did not breed them until they became negative to the test, and he only had one cow out of his whole herd that failed to become negative, and he sold her. He is recommending that method to his neighbors. Two or three of them have had the same experience. What do we know about delayed breeding in getting clean herds? One man shakes his head. Let me say to him that our university shook its head. When I got the test, and our university had made it, they said, "We guess you had better publish the article." They had made the test for this man. Their own test showed his herd was free from the disease. Then, of course, they naturally had to recognize their own child, and they have given it some weight. I am not so sure but that there is something to it. Who is here that knows there isn't anything to be considered in delayed breeding of a herd that is infected with Bang's disease?

QUESTION: How long was the breeding delayed in that instance?

MR. GLOVER: It varied; in some cows it was several months; in others it ran a year or more. They were not uniform. There was one that did not become negative, and she was sold to the butcher.

DR. C. E. COTTON: This reminds me a good deal of the early days of the tuberculin test work. I can recall the time they required us to retest animals that had been condemned. We retested. A great number of them would fail to react. They were allowed to be put back in the herd. We finally found that that was dangerous.

We have had sufficient experience, in our opinion, in control work in our state, with Bang's disease to date, to justify our agreeing with Dr. Donham's statement from a control standpoint.

I recall one instance in particular, in fact the first accredited herd for Bang's disease in Minnesota, which had been accredited for two years. We suddenly had a flare-up. We had six reactors. The explanation was this: This organization had two farms. They maintained a Bang's disease farm, but they had this accredited herd on another farm. They had sent an animal's blood into the laboratory because she was the outstanding animal in blood lines, in that herd. It was reported negative. She was put back in the accredited herd. On the next test we got that animal and five more. That is just one experience. We find that the young animal, that is not sexually matured, will give suspicious or positive and will go clean later. We feel that animal is safe to be considered negative from a control standpoint. From our experience, if you have an animal that has reacted to the test, from a control standpoint you should look on it as a dangerous animal in the future.

MR. GLOVER: I think we are comparing things that differ, Doctor. Tuberculosis is one sort of a question. We found out that once a reactor always a reactor. The lesions may heal. But we have good evidence by our best scientists that animals do get over abortion and they are free from the disease. They do not have the germs. As I understand it, they are never free from tuberculosis, even though they become non-spreaders of the disease. I think we are comparing things that differ. I don't believe we can reason one to the other any more than we can reason this football team beat that one, and that one beat this other one, therefore this one will beat that. If you match them up, it will be just the reverse of your conclusions.

DR. E. A. WATSON: I think many of us must sympathize with the federal Bureau of Animal Industry or with any other governing body that is asked at this stage to promulgate regulations or control measures that are going to meet with the approval and coöperation of the great body of veterinary officials and stock-owners throughout the country.

Despite the evidence that Mr. Glover brought out, there are differences in interpretations of the test reactions that are greater than the differences in the technic of the tests. In our journals and in our meetings we are discussing, perhaps too much, the variations in the technic of the agglutination test and the necessity, as we say, of standardizing the test and making it uniform for all laboratories and all states. If we were more in agreement on the interpretation of the test and its application as a control measure, then it would be very much easier, I think, to try to elaborate or promulgate regulatory measures that would meet with general satisfaction. I would welcome a greater degree of discussion upon what we are to do with the reactors when we get them.

As Dr. Rettger said, we are not all quite of the same viewpoint as to what is a positive reactor, especially when we come down to the

1:25 cases. That should be borne clearly in mind. In connection with the question of the small percentage, six or seven per cent, that is on the borderline of 1:25-dilution reactors, I cannot see any objection. The introduction of the complement-fixation test in our hands has eliminated not all but a good deal of the doubt as to whether those low-dilution reactors are really reactors or not, but sometimes it does seem that too much attention, perhaps, is being drawn purposely to the technic of the test rather than to the actual methods of control when we come to apply them. Sometimes it looks like drawing a herring across the trail. We are not in agreement as to what we can do and what is the best method of controlling the disease when we run into it.

I believe a great majority of us accept the test as being just as reliable as the tuberculin test, but there is far more difference of opinion, I believe, as to our interpretation of it in its application to controlling the disease itself. It is on that phase of the whole subject that the live stock men are beseeching the governments and states and boards for measures, actual control measures in which we are agreed but on which at present there is so much disagreement. I should like to hear more discussion on that line.

MR. GLOVER: I came here to get information on this. I would suggest this to the federal government: If they find that there is such conflict of opinion concerning the regulation of this disease or the interstate shipment of it, or that we do not have sufficient foundation upon which to promulgate these rules and regulations for interstate shipment, that they say so, and that they point out definitely where we need more information before such rules can be made. That would seem to me to give opportunity for states that wanted to ship their cattle into other states to bring it to the attention of those officials who are keeping cattle out, not because they are trying to suppress the disease but because they are trying to make a wall around their state so there will not be free interchange of commodities between the states.

In my opinion, we are approaching a rather serious situation in this country when one state tries to prevent another state from shipping its products into that state. I am for the control of diseases of all character, and stand steadfastly as I have with you men for nearly thirty years, but I am absolutely opposed to a state, under the pretense of preventing disease, stopping the interstate shipment of cattle. I think the federal government can help this if they wish to point out wherein we do not have sufficient information to draw up the rules and regulations under which cattle should pass in interstate shipment. (Applause)

PRESIDENT MALCOLM: Gentlemen, if there is no further discussion on these papers, that ends the program for today.

. . . The session adjourned at 4:20 p. m. . . .

RECESS

THURSDAY MORNING, DECEMBER 1, 1932

The third session convened at 9:45 a. m., President Malcolm presiding.

PRESIDENT MALCOLM: The first paper this morning will be by Dr. F. B. Hadley and Dr. W. D. Frost, of the University of Wisconsin, "A Six-Month Study of Bovine Mastitis in a Herd of 100 Cows."

. . . Dr. Frost read the paper. . . .

A SIX-MONTH STUDY OF BOVINE MASTITIS IN HERD OF 100 COWS*

By F. B. HADLEY and W. D. FROST

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The herd selected for this study consisted of more than 100 cows and data were secured from exactly 102. All of the animals were pure-bred Holsteins. Provisions for the care and management for this herd were of the best. Moreover, the farm manager, an agricultural college graduate and a man of wide and successful experience, was interested in improving the condition of the herd and the quality of the milk, and so coöperated most intelligently in securing the data.

Previous bacteriological examinations of the milk from this herd, extending over a considerable period of time, had shown the milk to be remarkably free from hemolytic streptococci and to have a uniformly low bacteria count.

On the strength of these examinations and the report of the manager that pronounced cases of mastitis were rare, it was believed that the herd was unusually free from mastitis, although a veterinary examination to determine the actual condition of the cows' udders had not been made.

The herd appeared, therefore, to be well suited for the study in that it apparently was as nearly free from udder diseases as could be expected under the circumstances and so might serve as a model which other producers might well attempt to emulate.

PLAN OF PROCEDURE

The program decided upon was to examine and test each milking cow once a month for six months, beginning in December and ending in May. To detect evidence of mastitis two series of tests were to be made. The first series were to be conducted at the time of examination, so were termed "stable" tests; the second were to be made after taking the samples to the laboratory, so were designated "laboratory" tests. (1) The stable tests consisted of (a) a physical examination of the milked-out udder to discover evidence of any abnormal condition; (b) the

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†The authors gratefully acknowledge the assistance of Prof. E. G. Hastings, in planning the work; Drs. Edward R. Carlson and C. Roy Strange, in carrying out the stable tests; Mildred A. Engelbrecht, Zina Parlette Kuckuk and Helen Whitgrove, in the bacteriological analyses, and Prof. H. H. Sommer, in determining the hydrogen-ion concentration.

use of the strip-cup provided with a screen to detect flakes and clots of casein and mucus in the milk; (c) the use of strips of filter paper impregnated with brom cresol purple to determine the approximate chemical reaction of the milk. (2) The laboratory tests consisted of (a) a bacteriological examination of a composite sample of fore milk from all quarters, unless the previously conducted stable tests had revealed evidence of mastitis, in which event an examination of the milk from each quarter was to be made; (b) the determination of the exact chemical reaction of the milk samples by an electrometric apparatus (quinhydrone electrode) to establish the pH or hydrogen-ion concentration.

All bacteriological examinations were made on blood-agar plates and the total number of colonies counted. The alpha and beta streptococcus colonies were counted separately, and the variety determined. In case the total count was high and the predominant organisms were apparently not streptococci, an attempt was then made to identify them. However, in the first two analyses, comparatively little attention was paid to the qualitative results, but later attempts were made to pick and type all streptococci and such other organisms as appeared to be of pathogenic significance.

It was planned, after securing the information needed, to divide the herd into three groups of cows the better to study the different forms of mastitis. These groups consisted of (1) cows with distinct clinical mastitis; (2) cows with normal or apparently normal udders; (3) cows with relatively high bacteria counts and usually some other evidence of mastitis that might indicate a latent infection, or were not classifiable in either of the other groups.

RECORDS

A form was devised for recording the data secured at the various examinations and a separate form was kept for each cow. In the tables, however, only what we regarded as the most critical data could be included. This means that only the greatest abnormality and the highest bacteria count of all the tests made on each animal were included. As only a part of the samples were tested for pH and as the results were quite comparable with those secured with the brom cresol purple test papers, they have been omitted from the records presented in the tables.

DISCUSSION OF DATA

As already stated, 102 cows were studied, most of them six times, but some only a few times either because they had been

disposed of on account of severe mastitis, or for the reason that they became dry, unprofitable, or were sold for other reasons. Upon summarizing the data it was found that 30 of the 102 cows showed at some time during the six-month period definite mastitis; that is, they had enough mastitis to be detected by two or more of the stable tests. The individuals with their reactions are listed in table I according to the total number of bacteria found in the milk. The figures 2/6 and 6/6, for example, indicate the number of times a given test was positive and the number of examinations made.

Of these 30 cases of mastitis all but three showed, on one or more dates, physical evidence of mastitis; all but three others

TABLE I—Cows with distinct clinical mastitis. (Listed in order of total bacteria counts.)

SERIAL	PHY-SICAL	STRIP-CUP	BROM CRESOL PURPLE	TOTAL COUNT	STREPTOCOCCI		PREDOMINATING ORGANISMS
					BETA	ALPHA	
1	+1/4	+2/6	? 0/6	4,880	0	0 0/6	Alpha S. and Gram+ rod
2	+1/4	+1/4	0 0/4	5,920	0	5,760 1/4	
3	+2/6	+1/6	+2/6	8,320	0	880 2/6	<i>S. mitis</i>
4	+1/4	0 0/4	+1/4	13,120	0	10,140 1/4	
5	+2/3	+2/3	+2/3	14,400	0	14,400 3/3	<i>S. mitis</i>
6	+4/6	+1/6	+5/6	16,000	0	5,000 2/6	
7	+2/4	+1/4	+1/4	18,800	0	18,800 4/4	<i>S. mitis</i>
8	+5/6	+1/6	+1/6	22,400	0	22,400 5/6	<i>S. mitis</i>
9	+4/6	0 0/6	+2/6	25,280	0	0 0/6	Coliform 3/6
10	+4/6	+1/6	0 0/6	30,720	0	13,200 4/6	<i>S. mitis</i> and <i>S. fecalis</i>
11	0 0/6	+1/6	+2/6	35,520	0	220 2/6	Staphylococcus
12	+3/6	+1/6	+2/6	36,480	0	36,480 6/6	<i>S. mitis</i>
13	+3/3	+1/3	+2/3	40,860	180	22,860 2/3	<i>S. mitis</i>
14	+4/6	+2/6	+6/6	70,720	0	100 3/6	Gram+ rod
15	0 0/5	+4/5	+5/5	85,040	0	24,320 4/5	<i>S. mitis</i>
16	+2/6	+2/6	+2/6	107,520	0	107,520 6/6	<i>S. mitis</i>
17	+4/6	+5/6	+3/6	109,440	0	103,040 4/6	<i>S. mitis</i>
18	? 0/6	+1/6	? 0/6	114,560	20	37,760 4/6	<i>S. mitis</i>
19	+5/5	+2/5	+5/5	408,800	0	13,120 3/5	<i>S. mitis</i>
20	+6/6	+5/6	+5/6	1,000,000	80	1,000,000 4/6	<i>S. mitis</i>
21	+3/5	+3/5	+4/5	1,040,000	0	1,040,000 2/5	<i>S. mitis</i>
22	+1/1	0 0/1	+1/1	1,684,000	0	1,600,000 1/1	<i>S. fecalis</i> and <i>S. salivarius</i>
23	+3/4	+3/4	+2/5	3,360,000	0	3,360,000 5/5	<i>S. mitis</i>
24	+2/2	+1/2	+2/2	14,912,000	0	14,912,000 1/1	<i>S. mitis</i>
25	+2/4	+3/4	+3/4	40,000,000	100	40,000,000 4/4	<i>S. mitis</i>
26	+1/1	+1/1	0 0/1	108,000,000	0	108,000,000 1/1	<i>S. salivarius</i>
27	+6/6	+3/6	+3/6	112,000,000	0	112,000,000 4/6	<i>S. mitis</i>
28	+6/6	+4/6	+3/6	112,000,000	0	112,000,000 5/6	<i>S. mitis</i>
29	+4/4	+4/4	+4/4	128,000,000	0	1,360 2/4	Coliform 3/4
30	+3/4	+2/4	+2/4	384,000,000	0	384,000,000 3/4	<i>S. mitis</i>

were positive by the strip-cup test. That is, the three cows with mastitis that were negative on physical examination were positive with the strip-cup test and the other three vice versa. This is a percentage efficiency of 90 for each test. What has just been said about the comparative values of the physical examination and the strip-cup test also holds true of the brom cresol purple test. In other words, each of these three stable tests showed an efficiency of 90 per cent. If any one of these tests had been employed alone, and the results considered without reference to either of the others, three cases of mastitis (10 per cent) would have been missed. If any two of the tests had been employed all these cows would have been detected. It is evident that the results of the three stable tests are better guides in detecting, *i. e.*, diagnosing mastitis than any one alone, although any two of them would have answered.

Turning now to the bacteriological tests and their significance as aids in the diagnosis of mastitis, we have first to consider the total bacteria counts. In general we notice that these counts are high; eleven of the 30 cows have counts of 1,000,000 or more; four have counts in the hundred thousands, while only three have counts below 10,000. It would seem from these data that in general high counts in individual cows indicate the probability of mastitis in a high percentage of the cases, and that counts of over 20,000 on blood-agar should be regarded as suspicious. There is some question, however, as to whether the total bacteria count can be taken as an entirely reliable guide in classifying cows relative to mastitis. For instance, seven (23 per cent) of the cows listed in table I as having distinct mastitis, had total bacteria counts below 20,000. If this number is taken as the criterion, it is evident that bacteria counts alone have limitations as a means of diagnosing mastitis. Therefore, to be safe, other tests should be used in interpreting the bacteriologic tests, especially when the count is under 20,000.

The presence of particular kinds of bacteria is probably of more significance than the total counts in indicating the condition of the udder.

In looking over the table of 30 cows with this in mind, it will be noticed that 28 of them were shedding alpha streptococci. All but four of these (3, 11, 14 and 29) were shedding them in large numbers. These cows were undoubtedly infected with other kinds of organisms, as the column headed "Predominating Organisms" indicates, with the exception of case 3, which can not be explained with our data.

In dealing with the quantitative tests we accepted 20,000 bac-

teria as indicating infection. With the qualitative tests we suggest 5,000 as the approximate critical number.

Turning to the table again we see that 28 of these 30 cows had either high total counts, or 5,000, or more, suspicious organisms per cubic centimeter, or both.

If we reduce these findings to a percentage basis, as has been done for the other tests, we have an efficiency for the bacteriological methods of 93 per cent.

In regard to the significance of particular streptococci in relation to mastitis, it will be noticed that there is no evidence whatever in this herd that *S. mastitidis*, or other beta hemolytic streptococci, which have been regarded by some investigators as common causes of infectious mastitis, were responsible. In fact, only on five occasions were organisms of this type isolated and then in such small numbers that they were considered to be insignificant. The most common microorganism which could be considered as the cause in these 30 cases of mastitis was *S. mitis*, an alpha hemolytic streptococcus. Practically two-thirds of these cows were found to be shedding *S. mitis*, which investigators frequently refer to as *S. agalactiae*. Other organisms found included *S. salivarius*, *S. fecalis*, coliform bacilli, and staphylococci. In several cases, the predominating organism was undetermined.

In table II have been listed the 60 cows with normal or nearly normal udders. None had a total bacteria count above 20,000 per cc. Nine of these cows showed enough evidence of physical impairment at some time to warrant recording the fact. As the physical examinations were quite detailed, and as no distinction was made between lesions of long standing and those of recent occurrence and so of more significance, the records of this test are hardly comparable with the other data.

The brom cresol purple paper test was positive in five cows. Only two of these cows showed much evidence of physical impairment. It should be stated in this connection that this brom cresol purple test simply indicates approximate changes in the pH; moreover, it is not reliable as the end of lactation approaches and just after freshening, so some of the noted reactions are of no significance.

The bacteria count in this group of cows with normal or nearly normal udders ranged from 400 to 19,800. There were five with less than 1,000; 45 between 1,000 and 10,000; 10 between 10,000 and 20,000. In regard to the total number of bacteria reported, it should be borne in mind that all of the samples were of the fore milk, since our practice has been, in collecting the samples,

TABLE II—*Cows with normal or nearly normal udders. (Listed in order of total bacteria counts.)*

SERIAL	PHYSICAL	STRIP-CUP	BROM CRESOL PURPLE	TOTAL COUNT	STREPTOCOCCI		PREDOMINATING ORGANISMS
					BETA	ALPHA	
1	0	0	0	400	0	340	
2	0	0	0	440	0	360	
3	?	0	0	540	0	0	
4	0	0	0	640	0	0	
5	0	0	0	880	0	0	
6	0	0	0	1,000	0	0	
7	0	0	0	1,120	0	0	
8	0	0	0	1,200	0	0	
9	0	0	0	1,200	0	0	
10	?	0	0	1,680	0	60	
11	0	0	0	1,680	0	0	
12	?	0	0	1,680	0	0	
13	0	0	0	1,650	0	0	
14	?	0	0	1,760	0	0	
15	?	0	0	1,760	0	640	
16	0	0	0	2,000	0	20	
17	+	0	+	2,080	0	0	
18	0	0	0	2,240	0	0	
19	?	0	0	2,240	0	0	
20	0	+	0	2,480	0	320	
21	0	0	0	2,720	0	760	
22	+	0	0	2,720	0	20	
23	+	+	0	2,720	0	180	
24	0	0	0	2,880	0	0	
25	?	0	0	3,040	0	0	
26	0	0	+	3,200	0	280	
27	?	0	0	3,360	0	0	
28	0	0	0	3,360	0	0	
29	0	0	?	3,520	0	540	
30	0	0	0	3,600	0	40	
31	0	0	0	3,680	0	1,400	<i>S. mitis</i>
32	0	0	0	4,320	0	0	
33	0	0	0	4,480	0	0	
34	?	0	0	4,640	0	0	
35	+	0	0	5,040	0	140	
36	0	0	?	5,280	0	0	
37	0	0	0	5,440	0	1,120	
38	?	0	+	5,760	0	0	<i>B. coli</i> (?)
39	0	0	?	5,920	0	1,280	<i>S. fecalis</i>
40	0	0	?	6,240	0	4,480	<i>S. mitis</i>
41	+	0	0	6,720	0	580	
42	0	0	0	6,720	0	0	
43	0	0	0	7,200	0	0	
44	0	0	0	7,520	0	0	
45	+	0	0	7,940	0	0	
46	0	0	0	8,480	0	0	
47	?	0	0	9,120	0	0	
48	0	0	0	9,280	0	0	
49	+	0	0	9,600	0	0	

TABLE II—*Cows with normal or nearly normal udders. (Listed in order of total bacteria counts.)—Concluded.*

SERIAL	PHYSICAL	STRIP-CUP	BROM CRESOL PURPLE	TOTAL COUNT	STREPTOCOCCI		PREDOMINATING ORGANISMS
					BETA	ALPHA	
50	0	0	0	9,920	0	0	
51	0	0	0	10,880	0	1,600	
52	0	0	?	10,880	0	0	
53	0	0	?	11,520	0	7,360	
54	?	0	0	14,040	0	0	
55	?	+	+	15,200	0	760	
56	0	0	0	15,520	20	0	
57	+	+	+	16,000	0	0	
58	?	0	0	18,560	0	0	
59	+	0	0	18,880	0	0	
60	0	0	?	19,800	0	80	

to discard the first stream of milk and collect the second. There is no doubt that all of these counts would have been considerably lower had samples been taken from the entire milk or the strippings.

In regard to the beta hemolytic streptococci, none were found, except in one case in which only 20 per cc were present. In 22 of these 60 cows, alpha hemolytic streptococci were found. Five of these cows showed less than 100 per cc, 13 between 100 and 1,000, and five more than 1,000. These facts make it difficult to explain the significance of small numbers of alpha hemolytic streptococci in apparently normal udders. No evidence was found that atrophy of a quarter was the result of infection with a particular type of organism.

LATENT MASTITIS

There remains to be considered the group of 12 cows listed in table III with relatively high bacteria counts and usually other evidence of latent mastitis. As far as the physical condition of the udders of this group is concerned, seven of the 12 were found to have had lesions of mastitis sometime during the six-month period while under observation. Only four of them were ever positive to the strip-cup, while two others reacted with the brom cresol purple test. There was close agreement between the four strip-cup positives and the physical examination, but none between the strip-cup and the brom cresol purple findings. The total bacteria count varied in this group of cows from 15,200 to 123,300. In other words, the total count of the cows was relatively high and in 75 per cent above 20,000. Whether any of the cows will later develop clinical evidence of mastitis remains to be seen.

TABLE III—Cows with relatively high bacteria counts and usually other evidence of mastitis. (Listed in order of total bacteria counts.)

SERIAL	PHYSICAL	STRIP-CUP	BROM CRESOL PURPLE	TOTAL COUNT	STREPTOCOCCI		PREDOMINATING ORGANISMS
					BETA	ALPHA	
1	+	0	0	15,200	0	14,400	<i>S. mitis</i>
2	0	0	+	15,760	0	240	Staphylococci
3	+	0	0	16,300	0	2,000	<i>S. mitis</i>
4	+	0	0	20,480	0	8,320	Staphylococci
5	+	+	0	32,960	0	6,320	<i>S. fecalis</i> and <i>S. mitis</i>
6	0	+	?	34,000	0	480	Staphylococci
7	0	0	0	34,880	0	3,680	<i>S. fecalis</i>
8	0	0	+	40,400	0	180	Gamma streptococci
9	+	+	0	44,800	0	0	Staphylococci
10	0	0	0	59,440	0	0	Gram-negative rod
11	+	0	0	78,880	0	22,160	<i>S. mitis</i> and <i>S. fecalis</i>
12	+	+	0	123,300	0	6,400	<i>S. mitis</i> and <i>S. fecalis</i>

All but two of these 12 cows were shedding alpha hemolytic streptococci in numbers ranging from 180 to 22,160 and in eight of the 12 the number of alpha streptococci was below 10,000 per cc. In regard to the types of streptococci present, five were shedding *S. mitis*, and the remaining cows were shedding a mixed flora.

Cows such as those in this group with high counts are usually referred to as having latent or occult mastitis. It seems probable that cows of this description continue to harbor relatively large numbers of bacteria, so are potential "carriers" and "spreaders" of mastitis, but we have no direct evidence of this possibility. At any rate most of them can be detected only by a bacteriological examination. Some of these cows may simply remain as high counters, but others are undoubtedly incipient or mild cases which apparently at any time may flare up into the acute form, and perhaps always serve as sources of infection for other cows in the herd. Just what importance to attach to this group of cows from a practical management viewpoint cannot be answered from our present knowledge, so more work is planned on this phase of the problem.

THE SIGNIFICANCE OF ALPHA STREPTOCOCCI

A study of the data showed that 59 of the 102 cows were shedding, at some time, one or more alpha types of streptococci. This was a much larger number than we expected to find. The counts were low in many, *i.e.*, under 20,000 per cc, but in others ran into the millions. It was noted that when cows are shedding

these streptococci in numbers even less than 5,000 per cc, the chances of such animals showing clinical evidence of mastitis, either past or present, are five times greater than for those in whose udders streptococci are not demonstrable.

In further reference to the types of streptococci, it may be repeated that the great majority of them are found to be *S. mitis*, although two other types were frequently found, viz., *S. fecalis* and *S. salivarius*. There is no question that *S. mitis* is capable of causing mastitis; in fact, it is the organism which we have isolated most frequently from cases of mastitis in Wisconsin herds. There is also no doubt that some cows harbor it for long periods without developing mastitis.

SUMMARY

A herd of 102 cows was examined monthly for a period of six months. The examinations included both stable and laboratory tests. The former consisted of a physical examination of each quarter of the udder, the strip-cup test, and the use of paper impregnated with brom cresol purple. The laboratory tests included both quantitative and qualitative bacteriological examination, as well as the electrometric test for the actual pH value or chemical reaction. These various tests made possible the division of the herd into three groups, viz., cows with distinct clinical mastitis, cows with normal or nearly normal udders, and cows with relatively high bacteria counts and usually other evidence of latent mastitis.

Thirty cows were found to be affected with definite clinical mastitis. Most of them could have been detected by any one of the tests employed, but the results of two or more of the tests provided a much more reliable basis for diagnosis, while the results of all tests furnished the information needed for best judgment by the veterinarian and bacteriologist. There was no difference in the relative value of any one of the three so-called stable tests, each detecting 90 per cent of the cases. The quantitative bacteriological examination was not quite so satisfactory when 20,000 or more bacteria per cc were taken as the criterion but this together with qualitative tests gave an efficiency of 93 per cent.

The study revealed only 60 cows that could be considered normal or nearly so. None of them had a total bacteria count above 20,000 per cc. Some, however, showed evidence of having had mastitis previously, but since the bacteria count was relatively low they were considered to be practically free from mastitis.

There were present in this herd 12 cows that we have classed as suspicious cases of mastitis, although some showed clinical symptoms. These 12 with the 30 clinical cows make a total of more than 40 per cent of the herd having either evident or latent mastitis sometime during the course of six months.

From the data obtained in this investigation it would seem that a complete and satisfactory picture of the condition of the cow's udder can best be obtained by combining the three stable tests as we have done, and making bacteriological examinations of the milk from individual cows to include the identification of the predominant organism in the case of high counters. This is because no one test is entirely reliable, each having certain limitations, yet may furnish information not supplied by any of the others from one examination.

CONCLUSIONS

The following conclusions seem justified:

1. Although the herd studied was exceptionally well managed and kept under exceptionally good conditions, about 40 per cent of the cows had more or less mastitis at some time during the six-month period.
2. The actual condition of this herd, as far as mastitis is concerned, was revealed only when repeated examinations were made extending over a considerable period of time.
3. Stable tests, which consist of a physical examination, the use of the strip-cup and the brom cresol purple test, offer ready means of detecting mastitis and, if regularly used, give an approximately correct picture of the herd in so far as the condition of the udder is concerned.
4. Detailed bacteriological studies are desirable supplements to the stable tests, especially if they include the blood-agar plates and the typing of the etiological agents. This more exact and complete picture gives a basis for more definite diagnoses and prognoses.
5. Some cows give a milk with the high bacteria count, which can be detected only by a bacteriological examination, but whether cases of this kind are latent mastitis and whether they are significant from the standpoint of controlling the disease in the herd has not been determined and this is true even if the microorganisms present are streptococci.
6. When a streptococcus becomes implanted in the udder it has a remarkable ability to remain. While the data presented do not warrant making a diagnosis of mastitis on merely demonstrating streptococci in the udder, it does show that clinical

symptoms are much more likely to be present in those cows shedding streptococci than in those cows whose milk does not contain them.

7. The etiological agent of mastitis found most frequently in this herd is a member of the alpha hemolytic group of streptococci, known as *S. mitis* according to Holman's system of classification, and as *S. agalactiae* by other investigators. Other alpha types were found, viz., *S. fecalis* and *S. salivarius*, in a few cases. A few cases also were caused by members of the colon-aerogenes group.

DISCUSSION

DR. C. A. CARY: I was glad to hear the paper bring out the idea that the bacteria count is not the final thing in testing cows' udders for mastitis, or for testing for infection. Also that the authors think more of the kind of germ that is present than they do of the bacteria count.

I think the U. S. Public Health Service standard of milk inspection is short in this idea, that they too frequently depend on the bacteria count more than any other thing they do in milk inspection. I think it is a mistake. I think that is one reason why some of these methods in milk inspection are erroneous in a great many instances.

I call your attention to this because in my report I shall have a conclusion stating this fact. I am glad that this paper has brought that out.

PRESIDENT MALCOLM: That brings us down to the report of the Committee on Meat and Milk Inspection, by Dr. C. A. Cary, State Veterinarian, Auburn, Ala.

DR. C. A. CARY: Gentlemen, for two years I have been trying to get a report on milk and meat inspection in all the states in the Union and a great many of the cities. I just want to cover some of the difficulties and some of the shortcomings of the report.

First, I want you to understand that this report is not final, except for a few of the states. I took the occasion to write three, four and sometimes more men in a state to get an answer to a questionnaire that I sent to each one of them, and I want to say to you that too frequently those reports were in conflict and did not agree in a great many things. It was rather difficult for me to take those reports and get an accurate summary of the meat and milk inspection in those particular states.

I am not going to read all of the report, but when you read it and it says something about your state that is not true, don't blame me altogether because I could not get at the exact facts in all states. After two years' work, with two attempts at sending out questionnaires, this has been the result.

I am going to say things plainly this morning. I don't like going roundabout the thing and being afraid to say what we ought to say for the benefit of the veterinarians of the United States or of America. I believe in going after what we have coming to us.

I want to say a few things to you veterinarians. Too many are afraid to do what you ought to do, politically and otherwise, especially in meat and milk inspection in your respective states, if you want to get this in the hands of the veterinarian. You say to me, "Well, you get into politics." Of course you get the politicians to hit you once in a while

but go right on and do good work and you will beat the politicians. I say this with all due respect to everyone.

I want to say a few words about the colleges. The colleges have been doing very well in teaching milk and meat inspection in the last few years. Some of them are not doing as well as they might; they are not devoting enough time to it, enough practical work. I know but one veterinary college that actually has in connection with it a slaughter-house where it can teach practical meat inspection. That should be taught to the undergraduate so that when he goes out to the country towns he will know how to construct a slaughter-house and how to conduct it. You must have this. Why? In the end, the entire United States is going to take care of its own meat inspection and every bit of it ought to be done through the veterinarian. There isn't any question about it. No other man is qualified for it. He wants to be put on the ground and be ready for it. Who is going to do it? The veterinary schools. If they don't do it, they are derelict in their duty.

I arranged this part of the program and put on a number of men without consulting them. I don't blame them if they do not want to talk. You see how many men we have here who are veterinarians, to take care of this subject. I did not consult them. They should be able to tell in five minutes everything they desire.

You say, "We don't want to hurt anybody's feelings." Let me touch the question of the dairy graduate, the animal husbandry graduate, doing meat and milk inspection. What can they do? I am going to tell you. What does the dairy graduate know about milk inspection? He is supposed to know about it, and he thinks he does. He wants to be a milk inspector, and in some places he is a milk inspector. What does he know about it? He knows something about the bacteriology of milk, not the pathogenic but the general bacteriology of milk. He knows how to plate and count bacteria. He is not qualified to differentiate between kinds, and do all that sort of work. He is not qualified to inspect cattle for disease. He is not a graduate veterinarian. Let him have what is coming to him, and let him stay in his place.

You say, "What does the animal husbandry graduate know?" Very frequently I run into an animal husbandry graduate doing meat inspection. He is not qualified. I want to go back to the veterinarian. In one of the largest states in the Union, where milk inspection is under either the Board of Health or some other department, animal husbandry graduates do milk inspection. There is hardly a veterinarian on the entire milk-inspection force of the state. The man in charge wrote me this sort of reply, when I asked him how about the veterinarian being qualified to do milk inspection in his state: "I find the veterinarians in my state are not qualified to do milk inspection." That is what he said. He is in charge. I could hardly get a reply out of a veterinarian in that state in regard to milk inspection. They seemed to be afraid of the politics in the state. That is a fact. Let us take these things as they are. I am not using any names in this state, but what was the matter with him? I suppose he had in his state a lot of the old-line veterinarians who were never taught anything about meat or milk inspection, and when he pulled them up to square them, they did not know as much as he did.

As I said before, the schools must put in the field men who have been taught, as undergraduates, what to do. That is my idea of these things, and I want to put it before you. I believe you ought to have these things. I want to say to you that if you don't like what I say about this report, I don't want another year of it; I have had two. It has been a hard job. A good many of them have felt a little sore at me because I asked them direct and pointed questions. But how are we going to get at the truth if our own men in the different states don't

know this and cannot report it when they get a query? Is it any wonder we are losing ground? If we had veterinarians in charge of milk and meat inspection in all the different states, we would place 5,000 more veterinarians in this country. Is that of any interest to you? It ought to be. It is a field that belongs to us, and we ought to take it, politics or no politics. It will never come to us if we don't go after it.

Incidentally, I might tell you some things about some of the states. I won't say these are positive, but I want to report to you about some of these states, and I want to name some of them because they ought to be named; they are not doing the work.

Right here in Illinois the state veterinarian wrote me this: "We had meat inspection under us, but there was so much politics in the last two or three years we just abandoned it." Are you going to get anywhere that way?

Let us take Iowa. Outside of the cities, they have no competent meat inspection, and meat inspection is under the veterinarian in only a few cities. I had to verify that by sending back reports to men marked on the books as M.D.'s or other doctors. Over half of the men in charge of meat inspection are M.D.'s or other doctors. Iowa, with a great school, with more veterinarians per capita, probably, than any other state, has fewer veterinarians handling meat and milk inspection.

Let us look at it. What are we going to do? Some of them are waking up. I have talked to some of the veterinarians since I have been here. There are 99 counties in Iowa. If every county in the State had sufficient veterinarians to take care of the meat and milk inspection, there would be 100 to 200 veterinarians employed. Would that mean anything to the veterinary profession in Iowa?

I say to you these things are vital to you and to me. We want to get out and put our feet on the front line and go after it, politics or no politics. What do I care whether you are Republican or Democrat? It doesn't make a bit of difference. It is what you do that counts in your profession.

Some of the states have not done much. I want to read a report from one of the states that—probably some of you do not realize it—is doing more than any other state and has done more in the last two years. I am going to read this report solely because I did not know. Last year, when I tried to get a report out of this state, I could not get the exact facts. This year I got reports. This is one of the finest reports of any of the states, and I am going to read you that because it is an example for you. This is from California. We have some Californians here. I am mighty pleased to read this because it stands out in contrast to Iowa, Illinois, Indiana and Missouri. I don't say all the states are just like this. Minnesota has some very nice things. I think Minnesota has one of the best milk inspection systems in these central states.

. . . Dr. Cary read extracts from report on California. . . .

Notice that! Iowa has 99 counties and there is meat inspection only in some of the cities. Some of that work is done by the United States government.

California is a state way off, with no veterinary college but a good lot of veterinarians, and people from all over the world.

Do you see what meat inspection means to the veterinary profession all over the United States? We want to get busy. You want to wake up. You know how old I am; I am not going to be here many more years, but I hope I live long enough to see you people wake up in your respective states and do your duty.

The greatest system of meat inspection in the world is under the

Bureau of Animal Industry of the United States Department of Agriculture, headed by a veterinarian, not an M. D., not a dairy inspector and not, as I found in one of the states, a sanitary engineer. Just think of that! They had a sanitary engineer conducting milk inspection. Do you know how sanitary engineers are made? We make some of them in our college. We give them a little course on sewers, sewer bacteria and water bacteria and some other things along the line of sanitation. That is given in the veterinary department. That is all right. We give that to the sanitary engineer, yet he is put in charge of milk inspection in some of the states. Think how far-fetched that is. It is so far-fetched that sometimes we have to get a microscope to find out what they are doing.

I placed on the program a veterinarian to discuss the question as to whether we should have meat inspection by the state, county or city as a unit. In my replies from the different states I found this varied in nearly all the states. Sometimes there is coöperation between the state and city or coöperation between the county and city, and sometimes there is coöperation between the state, county and city. If it is under the right direction and proper laws, it does not make any difference what the unit is, to a certain extent; it is how it is carried out. I believe the ideal method would be that of coöperation of the state, county and city. Then we could take in all the country and handle it. Why?

Let me illustrate how this operates. For instance, the state could have charge. The general supervisors could visit all parts of the state. If the county was in operation, they could visit the county men and see what they are doing and give some directions and see that they coöperate under the state law. Then the county could take hold of the cities. Sometimes the counties do not do a thing. It is done by the city. Why? For the reason that the city is the easiest unit for them to take up. It is concentrated, as it were. It controls the killing very readily. You say, "What are you going to do when you go to the country?" The time will come just as it has in some of the countries in Europe, where you will have little, local slaughter-houses as they have in the dorfs in Germany. In Germany, in the little villages and dorfs, they have a meat inspector who comes around every so often and inspects the meat at killing time, and passes it or does not pass it. The only trouble with the village meat inspector in Germany is that he is not always a veterinarian, as far as I could find out. I went around to the little villages in Germany and I saw the meat inspection. Never did I see a veterinarian do any meat inspection in the villages of Germany. We don't want that. Why? They are not qualified. We want graduate veterinarians. If we had that system we must have the veterinarian travel around. We have it to some extent in some of the counties in a state where one man takes in five or six cities or towns for meat inspection. They kill only a few animals every day. The hours for killing at these respective places are so arranged that the inspector, with an automobile, can cover that territory and do what we call county inspection work. I don't care what system you use, just so it is efficient, and you have graduate veterinarians doing it. There are some conclusions I want to read to you. It does not make a bit of difference to me whether you adopt them or not; I want to bring them before you. The idea is to get some of these ideas into your head.

. . . Dr. Cary read recommendation 1. . . .

I am not one who is going to measure humanity and work altogether by a yardstick. If you put into effect the same laws in Illinois that they have in Iowa, I don't care, if you get the results. Iowa may have

a state-wide system and put it in force, and Illinois may have a city system or a county system and put it in force.

. . . Dr. Cary read recommendations 2 and 3. . . .

Some of you may doubt this, and some of the men in charge of these things may doubt it. They may doubt it because they don't know any better and because they got hold of poor veterinarians, and we have some of them. When I did the tick eradication in Alabama, I had veterinarians from every college in the United States and some European colleges. There was one in particular. Somebody said he ought to be a good one, that he had gone to one of the best schools in the country. He came to my state. We put him to work on tick eradication. I found that he was like a good many of our own men, he didn't know much about it; he didn't know ticks; he had some book knowledge. There is one trouble with some of our colleges, and I am going to tell you this right here. There are too many teachers in college who have never had any practice. Seventy-five per cent of our students go into practice. I don't know but that the time should come when we should require that a teacher have so many years of practice so he will know something about the practical points.

Let me illustrate what I mean. The other day I had one of the best known veterinarians in this country at my clinic. We were doing an operation. We had a nice table and everything. We had a difficult operation, and we cast the animal just as a man would have to do on the farm. This man said, "Why didn't you put the animal on the table?"

I said, "That would have been all right for you and me, but we did this for the boy going to the country. We did it the way he will have to do it." That is what we need, some practical men and not laboratory men who don't know anything but the laboratory.

I had a boy graduate last year. He was the brightest lad in the class, had the best standing, I mean collegiate standing. He came to me and said, "Doctor, I just cannot go out to practice unless you lend me a microscope."

I said, "Why do you need it?"

"I just couldn't tell whether a dog had worms, without the microscope."

I said, "My God, have we done that with you, that you have to look through a microscope every time you make a diagnosis? You go out there and go to work."

I did not object to his having the microscope, but he was not prepared to practice without it.

. . . Dr. Cary then read recommendations 4 and 5. . . .

That is another thing I want to call to your attention. The college veterinarian is not trained in a few things like this. He ought to be trained in how to construct a real good, practical, workable slaughterhouse for a small town. He ought to be trained in how to get up laws to work for the counties and the cities. I don't want to tell you what I have done, but I wrote what probably is the only little bulletin on slaughterhouses for small towns that has been written in America. It has been run in two or three different editions. I have sent it to a great many laymen and college men. I don't say that it will apply every place, but it gives them a standard to work on. We need that kind of work.

. . . Dr. Cary read recommendations 6, 7, 8 and 9. . . .

What is the matter? You may know it. In milk inspection, the Treasury Department inspectors go to the different states. They want to adopt a standard system for every state and every county and every city and have it carried on by men who are not qualified. The whole

thing is based on two things; bacteria count and pasteurization. Those two things are the whole basis of the milk inspection system of some of these places. It is too narrow, and it isn't efficient, and it does not take care of the situation.

. . . Dr. Cary read recommendation 10. . . .

We have just two systems in the United States that stand out, the United States Army and the United States Bureau of Animal Industry, doing meat inspection only by veterinarians. Milk inspection should be so conducted.

. . . Dr. Cary read recommendations 11 and 12. . . .

What do I mean by "paper reports"? I went to one of the cities in Alabama that is run by one of these systems. The inspector said he got a letter from the state milk inspector. I said, "What did he want?"

"He just jacked me up about not getting in better reports. I reported things as they were." He wanted a better report. He wanted a made-out report, one of these paper reports. You know how they are made. They are made in the office. That is the trouble with all the milk inspection; it is made too much in the offices, in the cities, and not enough in the dairies or any other place. That is what is the matter. They think pasteurization and bacteria counts tell everything about the milk.

You say, "What are they going to do in a city like Chicago? Chicago is a great big city and it cannot get out and inspect all the dairies. What can it do?" It can require the state or the counties or the cities to do it or refuse to let the milk come into Chicago. That is the way they can do it, rather than depend entirely on bacteria counts and pasteurization. Pasteurization never cleaned any milk; a bacteria count never told everything about milk; sometimes the count itself is inaccurate. You know when you multiply figures you make a mistake of one or two in the count. Then when you multiply by thousands and millions, a little mistake in the beginning makes an enormous mistake at the end.

Gentlemen, I have talked about this offhand, and I want to let this Association see the reports from all the states, but don't understand that I have this thing accurate from all the states; I do not. It is the only thing I could do. The conclusions I have given you are the only conclusions I could get, without a multiplication of things. I, alone, am responsible for these conclusions.

In what I have said I have not given you all the facts that you need, but I just wanted to wake you up to what we ought to do in order to get into a field that belongs to us and that we are entitled to. (Applause)

REPORT ON MEAT AND MILK INSPECTION

By C. A. CARY, Auburn, Ala.

State Veterinarian

ALABAMA

Twenty cities and towns have meat inspection under graduate veterinary inspectors.

Thirty-five cities and towns have milk inspection.

Nineteen cities and towns have milk inspection under a graduate veterinarian on part or full time.

If all the cities and towns in the State had efficient meat inspection, it would require 100 graduate veterinarians.

If all the cities and towns would enforce efficient milk inspection, it would require 150 graduate veterinarians.

Meat and milk inspection are under the State Board of Health and the local city or town health officer. There are too many dairy graduates and laymen who are doing milk inspection. There are no lay meat inspectors in the State.

ARKANSAS

Meat inspection: The state health officials have a regulation requiring state meat inspection, but it has never been enforced. Legislation in 1929 gave the State Veterinarian authority to inaugurate meat inspection at any place in the State, but made no appropriation for operating it.

Little Rock, Fort Smith, Texarkana, El Dorado and Pine Bluff have both meat and milk inspection under supervision of veterinarians. There is an effort being made on the part of the State Veterinarian and other veterinarians to promulgate state-wide meat and milk inspection under control and supervision of the State Veterinarian. Now there are only five cities that have efficient meat and milk inspection in Arkansas.

CALIFORNIA

Meat inspection: California meat inspection is under the State Department of Agriculture and enforced by the Meat Inspection Service of the Division of Animal Industry.

It is compulsory in all counties in California having a population of 27,000 or over. At present there are 41 counties having meat inspection. There are 58 counties in California and 41 of them have compulsory meat inspection. Some of the remaining 17 counties, by request, have state meat inspection. Cities and counties having their own meat inspection must operate under the Meat Inspection Service of the Division of Animal Industry.

The employment of veterinarians as meat inspectors is a general requirement. In the 41 counties having compulsory meat inspection they employ 151 veterinarians and 50 lay inspectors. All ante- and postmortem inspections are conducted by veterinarians.

It should be noted that California's meat inspection laws and regulations follow very closely the federal laws and regulations that are enforced by the Bureau of Animal Industry.

California's meat inspection system appears to be more nearly uniform throughout the 41 counties than the system employed in any other state. In fact, it is quite certain that California now has a model system of meat inspection.

Milk inspection: Milk inspection is under the Bureau of Dairy Control of the Division of Animal Industry in the Department of Agriculture. All local city or county officers operate under the Bureau of Dairy Control. In 1932, there were 581 cities and towns in California having milk inspection, and these places handled or controlled and inspected 90 per cent of all milk produced in the State. The State employs 15 veterinarians and 38 laymen in milk inspection. Some cities employ graduate veterinarians and many cities have laymen as milk inspectors. The local city milk inspectors are under, or work with, the local health officers, and, when possible, local veterinarians are employed in milk inspection. California has the largest number of cities and towns having milk inspection of any state in the United States.

CONNECTICUT

Meat inspection: Eleven of the largest cities have meat inspection and in each case the work is in charge of a veterinarian. They are

paid by the cities. The inspection is under the supervision of the local city boards of health. There is no state-wide meat inspection law. The cities fix their own ordinances governing and regulating the enforcement of meat inspection.

Milk inspection: Eight of the eleven cities that have meat inspection also have milk inspection under the supervision of veterinarians. In three of the largest cities milk inspection is under the Board of Health and the inspectors are laymen. The milk inspectors are also food inspectors. They work under the supervision of the city health officer, who is a physician.

FLORIDA

Meat inspection: Florida has only local city meat inspection. It is enforced under the supervision of the State Department of Agriculture. There are nine cities that have veterinarians in charge of meat inspection and six cities where laymen do the meat inspection.

Milk inspection: Nine cities have milk inspection under the supervision of nine veterinarians and six cities have laymen who do the milk inspection. Milk inspection is under the supervision of the State Department of Agriculture.

GEORGIA

Responding to your questionnaire of September 30, in regard to regulations governing meat and milk inspection in Georgia, a law was passed in 1914 which provides for the inspection of slaughter-houses, meat markets, meat and meat food products, dairies and dairy products, under the supervision of the State Veterinarian of Georgia.

A graduate veterinarian is employed as State Slaughter-House and Meat Market Inspector. A graduate veterinarian is employed as State Dairy Inspector.

Graduate veterinarians do the actual meat inspection for the State. Laymen, M. D.'s and graduate veterinarians do the actual meat inspection for cities.

The slaughter-houses in Georgia are owned by cities, private persons and companies.

Our experience is that a graduate veterinarian is best qualified and can do the most efficient meat inspection work. The same statement applies to milk inspection.

We have about 15 cities in Georgia which have efficient meat inspection under graduate veterinarians.

There are about 20 cities in Georgia which have efficient milk inspection under graduate veterinarians.

If the theoretical training given at the recognized veterinary colleges is put into actual practice by the veterinary inspectors, good results can be obtained.

We have a total of about 40 or 50 cities in Georgia which should have efficient meat and milk inspection. The majority of these could use the same veterinarian to fill both positions.

J. M. SUTTON, *State Veterinarian.*

IDAHO

The city is the unit in Idaho for making meat inspection, and the state for milk inspection. About eight or nine veterinarians are employed as meat inspectors in the state of Idaho.

There is no state-wide meat inspection law. The State Department of Public Welfare is supposed to make detailed inspection, in coöperation with the city unit. There is no organized effort to provide that graduate veterinarians do the work of milk inspection.

INDIANA

Indiana meat and milk inspection are under the State Board of Health. This Committee has received no statement concerning the inspectors or the work done by veterinarians, laymen or other kinds of inspectors. Moreover, no report has been received of the number of cities, towns or counties that have or carry on meat or milk inspection.

IOWA

No state-wide meat or milk inspection in Iowa is provided for in the code except that which comes under the sanitary food and dairy laws of the State Department of Agriculture. The Dairy and Food divisions of the Department of Agriculture supervise and enforce.

Meat inspection: The chief of the Dairy and Food Division makes the following reply: "Some of our larger cities have meat inspectors who look after retailing and handling meats locally. Quite a number of our cities have local meat inspection. In many cases these positions are on part time and are taken care of by veterinarians or M. D.'s. The inspectors of the Department also work with the local inspectors in various cities and towns."

Iowa has meat inspection in Des Moines (one veterinarian), Marshalltown (one veterinarian on meat and milk inspection) and Cedar Rapids (one veterinarian on meat inspection).

Milk inspection: Forty-four cities and towns have milk inspection. In these 44 cities are employed part or full time: 12 veterinarians, 5 physicians, 26 laymen and 1 chief of police.

ILLINOIS

Meat inspection: On October 1, 1931, Illinois ceased all meat inspection under our department. Prior to that time, we had three plants in Peoria and one in Elgin to which we furnished meat inspection. Requests for meat inspection became very numerous and we thought that politics had much to do with rendering inferior service by our inspectors. Furthermore, it was believed that the requirements for rendering such service by the State should not, in all fairness, be less than were required by federal inspection, and believing that meat inspection should be done by the federal government rather than the state, we ended all controversy by discontinuing meat inspection at all the plants.

W. H. WELCH, *Chief Veterinarian,*
Division of Animal Industry.

KENTUCKY

Meat and milk inspection in Kentucky comes under the Bureau of Foods, Drugs and Hotels of the State Department of Public Health.

Winchester, Lexington, Louisville and Paducah have meat inspection. There are 19 meat inspectors, 3 of whom are veterinarians and 16 laymen. Forty counties in Kentucky have milk inspection under the county health officer. In the cities in the 40 counties the U. S. Public Health Service Standard Milk Ordinance has been adopted. There are 44 milk inspectors in the 40 counties and only two are veterinarians, the other 42 being laymen.

MAINE

Meat inspection is under the State Department of Agriculture. Two cities, Portland and Bangor, maintain meat inspection under the supervision of veterinarians.

Milk inspection is carried on under the Bureau of Milk Inspection, a division of the State Department of Agriculture. There are 33 local city or town inspectors, four of whom are veterinarians, nine are physicians and 21 are laymen. There is no organized effort to provide graduate veterinarians for the work.

MARYLAND

This state has no state meat inspection law. It has a milk inspection law that is not in operation or enforced. The only city that has meat inspection is Baltimore and it is enforced by veterinarians.

Baltimore, Cumberland, Hagerstown and Frederick have milk inspection under the local Board of Health and a few veterinarians are employed.

If all the cities and towns employed sufficient veterinarians to have efficient meat and milk inspection, it would require about fifty graduate veterinarians to operate and enforce.

MASSACHUSETTS

All the cities and towns in Massachusetts have slaughtering inspectors who are appointed annually after being approved by the State Department of Public Health. The City of Boston, however, does not need to secure the approval of this Department before appointing a slaughtering inspector.

Each city in the state has a milk inspector, and a town may have a milk inspector. Quite a number of towns exercise this privilege.

A comparatively small number of the slaughtering inspectors are veterinarians. Quite a number of the cities appoint a veterinarian and a lay inspector, and the lay inspector does the work.

None of the milk inspectors in the cities are veterinarians. A few of the milk inspectors in the towns are veterinarians.

There is no organized effort to provide that graduate veterinarians shall do the real work of meat and milk inspection. It is to be assumed that a veterinarian would be best qualified as slaughtering inspector. The Director of the Division of Food and Drugs of the State Department of Public Health finds, however, that veterinarians are not well qualified as milk inspectors, but the best milk inspectors in the State are either chemists or bacteriologists.

MICHIGAN

Meat inspection: There is no state-wide meat inspection law. No reports received from any city or town having meat inspection. The State Department of Agriculture has promulgated a few general rules and regulations governing slaughter-houses and the handling of meat within the state of Michigan.

Milk inspection: Michigan has a state-wide milk inspection law which is under the Bureau of Dairying in the Department of Agriculture. No veterinarians are employed in state milk inspection. No effort is being made to have veterinarians do milk inspection work of any kind. The number of cities and towns having milk inspection not reported.

MINNESOTA

Meat inspection: Meat inspection is under the general supervision of the State Live Stock Sanitary Board. There are six cities in the State where real meat inspection is carried on by graduate veterinarians. The State Veterinarian has made an effort to induce all city

and town officials, where meat or milk inspection is carried on, to employ graduate veterinarians.

Milk inspection: Milk inspection is under the State Board of Health, which lends its help to all cities and towns that require or ask for it.

The cities and villages that have ordinances in Minnesota are 168. A few employ veterinarians and many employ laymen. The State Board does not direct or control the milk inspection in Minneapolis, Saint Paul and Duluth. These three large cities are separate or independent and employ largely veterinarians to direct and to do the actual milk inspection. It appears that Minnesota has a number of cities and towns with active milk inspection.

MISSISSIPPI

Meat and milk inspection comes under the supervision of the Bureau of Sanitary Engineering of the State Board of Health. There is no state-wide meat inspection, but there is a state-wide milk inspection law.

The real meat inspection work is done in the cities by veterinarians. The county is usually the unit and the work is done under the county health department. Some cities provide the funds to carry on either milk or meat inspection. There are eight veterinarians employed as meat inspectors, and two veterinarians who do only meat inspection. There are 15 milk inspectors who are laymen. There are 36 cities and towns in Mississippi that have adopted the sanitary milk regulations of the State Board of Health. This body employs a veterinarian who is the head of the meat and milk inspection in the State.

MISSOURI

In Missouri there is no state-wide law on meat or milk inspection.

Where meat or milk inspection is enforced in Missouri, it is done by the cities. No report has been received giving the names and number of cities that have milk or meat inspection.

Recently the City of Saint Louis inaugurated a new and complete system of meat inspection, with Dr. J. S. Koen in charge. All this work is said to be under a force of competent veterinarians. No doubt it will grow in efficiency until it becomes one of the best city meat inspection systems.

MONTANA

Montana meat and milk inspection laws are enforced by the State Veterinarian of the State Livestock Sanitary Board. Billings and Great Falls have meat inspection. Each has a veterinarian in charge and doing the inspection work. The state-wide milk inspection law empowers the Livestock Sanitary Board to make rules and regulations governing milk inspection. The corps of veterinarians of the Livestock Sanitary Board enforce the rules and regulations. Milk inspection laws have been rigidly enforced. Eleven cities (Butte, Anaconda, Missoula, Helena, Great Falls, Havre, Lewistown, Laurel, Billings, Glendive and Libby) have separate municipal ordinances.

On account of financial difficulties, meat inspection work has not been pressed. For the past 16 years there has been an organized effort in Montana to provide that graduate veterinarians shall do all the real work of meat and milk inspection in the state of Montana.

NEBRASKA

Meat and milk inspection in the state of Nebraska is under the Department of Agriculture.

The State has a dairy law, and it will be noted that under this law dairy cows need be tested no oftener in accredited areas or areas under supervision than is required to maintain them as modified accredited areas. However, some of the larger towns of the State have their own local milk ordinances which supersede the state law in the areas named. In these instances the tuberculin test is the main requirement with some supervision of sanitation usually carried on by laymen. The tests are applied by local veterinarians when called upon by the owners.

Regularly employed veterinarians on meat and milk inspection in the State are confined practically to the two cities of Lincoln and Omaha, where one in each city is employed. It would be impossible to tell you how many laymen are employed in dairy inspection locally within the State. The State employs a number of inspectors who have a wide range of duties, one of which is giving a limited amount of attention to enforcement of the state dairy law. These are all laymen and about twelve in number. They, of course, can not be considered full-time dairy inspectors.

There is no state-wide meat inspection law in Nebraska.

The state dairy law is enforced by the Department of Agriculture, and the town ordinances by the local boards of health in most instances. There is no organized effort to provide for graduate veterinarians doing the work of meat and milk inspection in Nebraska, either under the State Department of Agriculture or in the cities.

NEVADA

There is no meat inspection, but it is now being urged for the city of Reno. Reno and Elko have milk inspection. One veterinarian is employed in Reno and one in Elko on milk inspection. No laymen are employed.

There is no law covering actual antemortem and postmortem inspection, but there is a state law covering the sanitary inspection of slaughter-houses.

The law concerning the inspection of slaughter-houses is enforced by the State Board of Stock Commissioners and the state milk inspection law is enforced by the Department of Food and Drugs.

While there is no organized effort to provide that graduate veterinarians do the work of meat and milk inspection, every effort is being made by the veterinarians of the State in an informal way to give information to the proper officials regarding the advisability of having such work done by veterinarians.

Milk inspection in the city of Elko is done on a part-time basis by one of the veterinarians of the State Board of Stock Commissioners who resides in Elko; milk inspection in Reno is done on a part-time basis by a veterinary practitioner. Each is paid by the city he serves.

NEW HAMPSHIRE

In answer to your questionnaire under date of September 30, will say that the State of New Hampshire has no state-wide meat or milk inspection system. Practically all the cities, however, have milk inspection and usually some member of the local Board of Health has charge of same.

One city (Manchester) has a meat inspection ordinance and a graduate veterinarian is employed by the Manchester Board of Health. He does the meat inspection work.

There are no city slaughter-houses in New Hampshire; all are privately owned.

Personally I believe the only qualified meat inspector is a graduate veterinarian, as he is the only person that I know of who has had sufficient education along this line to carry out the duty devolved upon a meat inspector.

Relative to milk inspection: Either a dairy graduate or a graduate veterinarian is best qualified in my mind to do this work.

In answer to your 12th question, will say that there is not sufficient slaughtering done in all of the cities in our state to make it practical to have a graduate veterinarian put in his full time. With the exception of one or two cities, this could be handled nicely by the local veterinarian with the rest of his practice.

R. W. SMITH, *State Veterinarian*.

NEW JERSEY

There is no state-wide milk inspection. The state milk inspection does not provide for grades of milk. With the present setup it is possible for the state inspector to visit only about once each year the plants in the State which handle and distribute milk of whatever grade.

Inspection is under the Bureau of Food and Drugs of the State Department of Health. The chief inspector is a layman, but one who is technically trained in the control of food and drugs. He is the head of the Bureau of Food and Drugs of the State Department of Health.

No state-wide meat inspection is maintained. The actual work of milk inspection is divided into two classes. Inspection of dairy farms and dairy cattle is done by a graduate veterinarian. The inspection of pasteurizing plants is done by a technically trained layman who is especially qualified.

City slaughter-houses are privately owned. There are no municipal slaughter-houses operated by city government.

The chief of the Bureau of Food and Drugs believes that the most efficient meat inspection can be done by graduate veterinarians because they are obviously the best qualified for such work.

Efficient milk inspection depends upon the type of inspection work to be done. For dairy farms and dairy cattle inspection, it is agreed by the control officers of this state that graduate veterinarians are not necessarily best qualified unless they have trained themselves or have been especially trained in modern methods of handling and processing milk.

There is one physician employed as inspector of meat and one lay inspector. There are no dairy graduates acting as inspectors of meat. Seven of the larger cities in New Jersey have satisfactory meat inspection under the supervision of graduate veterinarians. Two cities employ veterinary inspectors whose work is not considered efficient.

There is one physician employed as milk inspector, and of fourteen laymen who are carrying on milk inspection work in New Jersey cities, eight may be classed as having had special training which qualifies them to do very good work. There is one graduate veterinarian as milk inspector.

It is generally considered that the recognized veterinary colleges are giving sufficient theoretical training in meat and milk inspection. The graduate veterinarian who has mastered the basic veterinary sciences is obviously well prepared fundamentally to do meat and milk inspection work. It is believed that few veterinary schools today are giving sufficient practical work along these lines.

About fifteen graduate veterinary inspectors for meat and thirty graduate veterinary inspectors for milk would be required in New Jersey if all cities carried on an efficient meat and milk inspection.

NEW YORK

Meat inspection in New York is under local authorities. The city is the unit.

Thirteen of the 40 cities that have meat and milk inspection have one inspector for both meat and milk. In these 40 cities there are 19 veterinary inspectors and 50 lay inspectors. There are seven counties where the county is the unit for milk inspection.

NEW MEXICO

There is no city, county or state meat inspection in New Mexico other than market inspection at Albuquerque, Roswell and Las Cruces.

There is no county milk inspection. The following cities, however, have such inspection: Albuquerque, Santa Fe, Las Vegas, Raton, Tucumcari, Clovis, Roswell, Las Cruces and Gallup.

Albuquerque is the only city in New Mexico having a veterinarian as a milk inspector.

The remainder of the above-named cities have lay milk inspectors.

New Mexico has no state-wide meat inspection law, but it does have a state-wide milk inspection law. The milk inspection law is enforced by the State Dairy Commissioner, who is located at the New Mexico College of Agriculture and Mechanic Arts.

There is no organized effort in New Mexico to provide that graduate veterinarians shall do the real work of milk and meat inspection.

Milk inspection is carried on through the annual tuberculin-testing of cattle and the laboratory bacteriological examination of milk as to bacteria count and the testing of milk for its butter-fat content.

The systems of milk inspection that have been tried and found effective are largely those now in ordinary operation in other cities and seem apparently to work with equal success.

As above stated, there is no system of antemortem and postmortem meat inspection or meat food products slaughtered locally for consumption within the State.

NORTH CAROLINA

Meat inspection: Meat inspection is under the State Department of Agriculture, Live Stock Sanitary Division, of which the State Veterinarian is the head. Thirty-seven cities and towns have meat inspection. Thirty-one of these have veterinary inspectors. Six of these have lay inspectors.

Milk inspection: Milk inspection is under the supervision of the Sanitary Engineer of the State Board of Health. There are 69 cities and towns that have milk inspection, and 23 of these employ veterinarians as milk inspectors. Three employ physicians and 43 employ laymen as milk inspectors.

NORTH DAKOTA

Bismarck, Jamestown, Valley City, Fargo, Grand Forks, Devils Lake, Minot and Williston have milk inspection ordinances, but no meat inspection. Veterinarians are engaged in milk inspection in each of these cities.

There is no state-wide meat inspection or milk inspection law. The State Regulatory Department makes some inspection where complaints are filed. There is no organized effort to provide that graduate veterinarians shall do meat inspection in the state. Milk inspectors gather samples of milk once or twice a month, which are tested for butter fat and cleanliness.

OHIO

Ohio has no state-wide meat or milk inspection. Cities or private persons own the city slaughter-houses.

Nine cities employ graduate veterinarians to supervise or do meat inspection. If all the cities and towns in Ohio carried on efficient meat and milk inspection, it would require 150 graduate veterinarians.

Cleveland, Columbus, Toledo, Canton, Springfield, Dayton, Macon, Akron and Youngstown have efficient meat and milk inspection in Ohio.

Columbus has seven veterinary meat and milk inspectors, seven lay inspectors and one veterinary chief food inspector. Toledo has seven veterinary and seven lay meat inspectors and one veterinary and three lay milk inspectors. Cincinnati has seven veterinary meat inspectors and six lay milk inspectors. Springfield has two veterinary meat inspectors and one veterinary milk inspector.

OKLAHOMA

There is no state-wide meat inspection system. Milk inspection is under the State Board of Agriculture. The Chief Inspector has been a physician but should be a graduate veterinarian. Meat inspection in one county is conducted by a graduate veterinarian; in the rest of the counties by laymen. The actual milk inspection is done by laymen.

All slaughter-houses and independent packing companies are owned by individuals or companies.

A graduate veterinarian is the only man capable of efficient meat inspection. A graduate veterinarian is best qualified and most efficient for milk inspection under any and all circumstances.

Tulsa has very efficient meat inspection under a graduate veterinarian. One city has satisfactory and efficient milk inspection under a graduate veterinarian.

Looking into the future, realizing that the veterinarian must be used for purposes other than the treatment of sick animals, I do not believe the veterinary colleges have given sufficient, adequate, theoretical and practical work in meat and milk inspection. I think they should be better trained for these duties, and in my judgment the graduate veterinarian, properly trained, far exceeds the training of any other person for this work.

If each and every city of Oklahoma, with a population of more than 3,000 people, were to employ only graduate veterinarians to perform the class of work referred to through the questionnaire, it would take at least 100. With few exceptions the veterinarian could perform meat and milk inspection service combined.

OREGON

Oregon has optional meat inspection and the city appears to be the unit. Portland, Eugene, Albany and Dalles have meat and milk inspection and each city employs one or more veterinarians. Portland employs two veterinary meat inspectors and two veterinary milk inspectors, with six lay inspectors. Each of the other cities employs one veterinary inspector. All of the meat and milk inspection is under the Division of Animal Industry of the State Department of Agriculture and the State Veterinarian is chief of this division.

PENNSYLVANIA

Cities, boroughs and townships of the first class are authorized by law to conduct (a) meat inspection and (b) milk inspection. Coun-

ties in Pennsylvania are divided into townships, of which there are several classes, depending upon population.

Data regarding the number of meat inspectors, or how many are veterinarians and how many are laymen, are not available. Sanitary inspections of dairy farms and milk plants in Pennsylvania must be made by persons holding a Certificate of Approved Inspector from the State Department of Health. Up to August 4, 1932, such certificates had been issued to 396 men. It is not known how many of these are veterinarians.

There is (a) a state meat inspection law and (b) a state milk inspection law.

The state meat inspection law is administered by the Bureau of Animal Industry. The funds for this work are so limited that only six men are assigned to this work, each having a district including 8 to 13 counties. All are veterinarians. These men work largely in the small boroughs and rural districts. The cities, boroughs and townships of the first class derive their authority for meat inspection from other and older laws and act independently. In many of the cities, some of the meat inspectors are veterinarians but in other units practically all are laymen. The work done in all of these units, however, is mostly market inspection and not really meat inspection. There are 3,000 slaughtering establishments in the State, many of them small.

In the local units, meat and milk inspection is under a board or department of health.

LOUIS A. KLEIN.

RHODE ISLAND

Rhode Island has state-wide meat and milk inspection under the general laws and the State Department of Agriculture. Graduate veterinarians do the meat inspection and laymen do the milk inspection. Only one city has meat inspection and it is done by a veterinarian.

Five cities have milk inspection and each one employs a layman as milk inspector. If all cities in the State employed veterinarians, it would require ten to do the meat and milk inspection.

SOUTH CAROLINA

Meat and milk inspection is under the State Board of Health and the cities.

Graduate veterinarians do all the official meat inspection.

Laymen do most of the milk inspection. Nine cities have meat inspection and nine veterinarians do the inspection. Very few cities have efficient milk inspection:

If all the cities in the State had efficient meat inspection, this would require about 50 graduate veterinarians. Graduate veterinarians are best qualified to supervise and do meat and milk inspection.

SOUTH DAKOTA

We have seven general inspectors who do general inspection work, as well as milk inspection work. We have one chief inspector, who is supervisor in the field and office, and one creamery inspector. None of the above-mentioned inspectors are veterinarians. These men are employed by the Division of Animal Industry, but they do not do meat and milk inspection work. We have a milk inspection law and a food law.

L. G. TROTH, *Secretary of Agriculture.*

TEXAS

Meat and milk inspection is under the control of the cities and towns in Texas.

There are 24 cities that have meat inspection and each has one or more graduate veterinarians supervising and doing the work of meat inspection. City ordinances regulate the control of all meat inspection. There is no state-wide meat inspection law. All recognize that the graduate veterinarian is the only qualified man to do meat inspection. Sentiment seems to favor state-wide meat inspection in Texas.

Milk inspection is under the State Board of Health and this body seems to favor having sanitary engineers as milk inspectors. One hundred and ten cities and towns in Texas have milk inspection, and 25 of these employ graduate veterinarians as milk inspectors and 85 employ laymen (many of whom are sanitary engineers) as milk inspectors.

UTAH

Meat and milk inspection are under the State Board of Agriculture. Only a few cities have ordinances on meat and milk inspection. They are Salt Lake City, Ogden, Provo, Cedar City, Nephi and Logan. Beaver County adopted an ordinance on meat inspection but at the present time it is not being enforced.

There are four veterinarians employed as inspectors in this capacity. In Salt Lake City the chief inspector is a veterinarian and under him are a number of laymen. In three of the other towns, inspection is done by laymen.

Utah does not have either a state-wide meat inspection law or a state-wide milk inspection law.

There is at the present time an effort being made to employ veterinarians in these positions. The City of Nephi has a milk inspection ordinance which provides the qualifications of the inspector, namely, a graduate veterinarian, but the meat inspection ordinance does not prescribe the qualifications of the inspector. A veterinarian has been employed, but at the present time a layman holds the job. An effort is now being made through the State Veterinary Association to bring complaint against the City and inspectors on the grounds that they are violating the Veterinary Practice Act by employing laymen to do veterinary work. If we can get a favorable decision in this case, we feel it will have a far-reaching effect.

W. H. HENDRICKS, *State Veterinarian.*

VERMONT

The inspection of the milk consumed in local towns and cities comes under the jurisdiction of the local health officers of the 248 towns in Vermont.

The inspection of the milk received in the licensed dairy plants, which are principally milk- and cream-shipping stations, is done by the Department of Agriculture.

The local health officers *do not*, as a rule, either inspect the dairies or make a systematic inspection of the milk sold in their jurisdiction. About one or two samples a year usually are taken and these are unsatisfactory for obtaining an account of the conditions surrounding production and the quality of the milk. Inspectors from the Department make systematic inspections on the platform of the quality of the milk as it is received, and also inspect some 5,000 dairies a year.

VIRGINIA

Meat and milk inspection by the Health Officer in eleven cities. In the rest of the State by the Dairy and Food Division, Department of

Agriculture, by four lay milk inspectors and four lay meat inspectors. In the eleven cities under health officers, four have veterinarians in charge of both meat and milk inspection. In four cities a layman does the meat and milk inspection. In three cities a veterinarian does the meat inspection and a layman does the milk inspection.

R. A. GIVENS, *State Veterinarian*.

WASHINGTON

Meat inspection: County and city coöperative meat inspection is in operation in two counties (Gray Harbor and Clark). The state-wide meat inspection is under the State Board of Health, and the Supervisor of Dairy and Live Stock in the Department of Agriculture is in charge of meat and milk. The direct enforcement of meat inspection is done by city meat inspectors, who must be graduate veterinarians.

Milk inspection: Milk inspection is under the Dairy and Live Stock Division of the Department of Agriculture and the State Veterinarian is the supervising inspector. All meat and milk inspectors are graduate veterinarians. Walla Walla and Tacoma have adopted the U. S. Standard Milk Ordinance.

WEST VIRGINIA

The city is the unit for both meat and milk inspection. Charleston is the only city having compulsory meat inspection. One veterinarian and one layman are employed. Bluefield employs one layman; Clarksburg, one layman; Parkersburg, one layman; Martinsburg, one physician; Wheeling, one physician; Huntington, two laymen; Fairmont, one physician; Moundsville, one veterinarian; and Logan, one layman.

There is no state-wide inspection law. The U. S. Public Health Service Standard Milk Ordinance has been adopted by the State Department of Health. Enforcement is under the direction of the Department of Health.

The system of meat inspection in Charleston is of no value. The veterinarian in charge pays no attention to the work and leaves it to the layman, who is incompetent. There is very little inspection at the time of slaughter. The inspector visits slaughtering establishments and stamps carcasses in the cooler.

Milk inspection is somewhat more carefully done. Particular attention is paid to sanitation and examination for bacteria content. There is examination of cattle for disease conditions where veterinarians are employed. The tuberculin-test requirement is very well enforced in all cities having ordinances.

One of the reasons there are so few veterinarians employed in municipal work in this state is the scarcity of available men. Another is that in some places where veterinarians were formerly employed, they have been replaced by laymen for the reason that they either failed to make good on account of lack of training for their work or from inattention to their duties.

WISCONSIN

I am pleased to answer your questionnaire of September 30 pertaining to meat inspection. I will answer the questions in the order in which they are asked.

Such milk inspection as we have in different communities in Wisconsin is under local control, in a general way under the direction of the State Health Department.

Since the meat and milk inspection that is being performed in Wis-

consin is under local city ordinances, the men who do the actual work are supplied by these communities. In some cases they are medical doctors, in some cases laymen, and in some instances graduate veterinarians. Only a limited amount of meat inspection is being performed and this is by veterinarians. Milk inspection is being performed by medical doctors, laymen and graduate veterinarians.

Most slaughter-houses doing intrastate work are owned by private companies. We have a few establishments which do an interstate business and have federal inspection service.

In my opinion a graduate veterinarian is best qualified for all phases of meat and milk inspection.

Other than cities having federal meat inspection, there is no meat inspection service. One of the large cities having federal inspection also has city inspection at plants which do not do interstate business and which do not have federal inspection.

My opinion is that we have about twelve or fifteen cities which have milk inspection ordinances. About a half-dozen of these have veterinary inspection. The others are inspected either by medical men or laymen.

I can speak of only one college, Kansas State College, with which I am familiar, and in my opinion the meat and milk inspection course at this institution is sufficient to acquaint one with the necessary knowledge to perform the duties of milk and meat inspection efficiently.

If every city in Wisconsin employed veterinarians for meat and milk inspection, I believe it would require the full-time services of fifty veterinarians.

W. WISNICKY.

WYOMING

All laws regulating fresh meat peddlers and dairy products are under the Dairy, Food and Oil Division of the State Department of Agriculture. No veterinarians are employed. It appears that there are two state and 23 city laymen employed in milk inspection in Wyoming and they inspect dairies and creameries.

RECOMMENDATIONS

The Special Committee on Meat and Milk Inspection, after making inquiries and investigation in all the states, makes the following recommendations:

1. That the states just beginning or remodeling meat or milk inspection should use the methods that will give the best results or the greatest efficiency.
2. That inflexible uniformity is not advised, but strict conformity to systems, laws and qualifications of inspectors should be observed in order to obtain the best results.
3. That the graduate veterinarian, when trained and educated as he should be in a standard veterinary college, is the only qualified person to do actual meat and milk inspection.
4. That the veterinary colleges should devote more time and pay more attention to this inspection service in special bacteriological work, pathology systems and methods of meat and milk inspection. In some instances it would be a great help for the colleges to hold special short courses in meat and milk inspection.
5. That every graduate should have specific instruction in meat and milk inspection, since nearly every veterinary practitioner may be called up to do part- or full-time meat and milk inspection work and aid the state, county or city authorities in making laws, and in carrying on meat or milk inspection.

6. That in certain instances dairy graduates and skilled technicians may do some bacteriological examination of milk, but in no instance or case should they be permitted to examine or test dairy cattle or milk for disease. The only person qualified to test cattle or other animals for disease is the graduate veterinarian.

7. That meat and milk inspection should be conducted and enforced by a graduate veterinarian under a state live stock sanitary board or the live stock sanitary division of the state board of agriculture.

8. That the United States Bureau of Animal Industry operates the best system of meat inspection found in America or Europe.

9. That the U. S. Public Health Service, now operated by the Treasury, Interior and various other departments, should be transferred to the U. S. Bureau of Animal Industry, where it could be operated as efficiently as said Bureau of Animal Industry (with the present competent veterinarian as chief) now does the largest and most efficient meat inspection system in the world.

10. That we congratulate the United States Army for establishing and operating a practical system of meat and milk inspection that is entirely under the control of the Army veterinarians.

11. That we believe the U. S. Public Health Service and some of the states and cities place too much credit on the bacteria count and pasteurization of milk and do not pay sufficient attention to the health of the cows, cleanliness of the dairies, and milk and dairy sanitation.

12. That the Standard Milk Ordinance and other systems depend too much on paper reports and not on sufficient attention to dairy cattle and sanitary dairy operations.

PRESIDENT MALCOLM: Gentlemen, you have heard the report on milk and meat inspection by Dr. Cary.

I noticed in his remarks that he brought out Iowa very prominently. I don't know all about Iowa. I don't have anything to do with the milk inspection in Iowa, but my department does have a little to do with the meat inspection. We have a meat inspection system in the state of Iowa that I think is very good, for the reason that the slaughter-houses that have inspection are located in different portions of the State and they send out wagons to supply the meat to the citizens of the State.

In Iowa we have a plan of that kind at Fort Dodge, where the meat is inspected by a veterinarian who is under the Division of Animal Industry. He is appointed as assistant state veterinarian for that work. We have another such plant at Webster City, conducted in the same way, and another plant at Perry, Iowa, that is conducted in the same way. At each of these plants they are instructed to make their inspections in accordance with the regulations of the United States Bureau of Animal Industry.

We have federal inspection of meat at Des Moines, Mason City, Waterloo, Cedar Rapids, Sioux City and Ottumwa. As far as conditions in Iowa are concerned, the consumer of meat who gets it from these plants is assured of veterinary examination and inspection. I just wanted to make these few remarks to explain conditions that we have in Iowa.

You have heard the report. What is your pleasure with regard to it?

DR. J. S. KOEN: I move the adoption of the report.

DR. SPRINGER: I second the motion.

PRESIDENT MALCOLM: It has been moved and seconded that the report on Meat and Milk Inspection by the Chairman, Dr. Cary, be adopted. Are you ready for the question?

DR. ROBERT BARNES: Perhaps I am entirely out of order but I am a stranger from a strange land. I happen to be charged with the administration of the Inspection of Meat and Canned Foods Act of the Dominion of Canada. I am particularly interested in today's program. I want to congratulate Dr. Cary on the manner and method in which he dealt with this and on his plain speaking. I agree wholeheartedly with everything that he has said, with the exception of one statement. He may not agree with me in that. He said that the Bureau of Animal Industry maintained the most efficient service in the world. I agree that it is a most efficient service, but Dr. Cary evidently did not investigate the Canadian service.

Outside of that remark I agree wholeheartedly with Dr. Cary's report, and I agree with its adoption.

DR. CARY: I wish to acknowledge the correction. (Laughter)

DR. G. H. HART: It is a little hard for this Association to know what it is adopting, as a result of Dr. Cary's speech. He has certain things written down, in addition to which he enlarged upon them by extemporaneous talk. From the extemporaneous talk, we might get the impression that pasteurization and bacteria counts are not very satisfactory in milk inspection. We might put the United States Department of the Treasury under the United States Bureau of Animal Industry. There may be some little, loose statements in the report which might cause some criticism to be directed against this Association in adopting the report as given by Dr. Cary.

I think we are all generally in agreement with the general understanding that we should take from Dr. Cary's talk. I am just a little hesitant about voting for the adoption of the report, inasmuch as I do not know exactly what the report is and what will appear in print. If everything he said is to be included in his report, I doubt if we ought to adopt it.

DR. KOEN: As I understand Dr. Cary's written report, if it is adopted it is not that we accept everything he says and subscribe to it, but he is presenting here the material that his Committee has secured from over the nation. If we adopt it, it will be published. Then we can consider it and leave out that which we do not approve.

DR. R. R. DYKSTRA: I feel a good deal the same as Dr. Hart does. I should like to offer as a substitute motion that we accept his report rather than adopt it.

DR. KOEN: May I withdraw my motion in favor of the one Dr. Dykstra made because it accomplishes the end that is intended. I second Dr. Dykstra's motion.

DR. C. H. STANGE: I should like to inquire whether that is being accepted as a report of the Committee or of the Chairman. It seemed to me it would be all right to accept it as Dr. Cary's report, but if you are going to accept it as the Committee's report, the rest of the Committee ought to know what is in it.

DR. CARY: Mr. Chairman, every man on the Committee had the sense to write his views to me. I could not present all the material that I had to the Committee. I had to make a summary. It is satisfactory to me to have it as my report. I will take all the responsibility.

PRESIDENT MALCOLM: Gentlemen, you have heard what Dr. Stange said regarding the proposition. I don't know what effect that will have on the vote as to whether you accept this or not. If I understand correctly, Dr. Stange's idea is that it be the Chairman's report that we are accepting and not the Committee's report.

DR. STANGE: That is right.

PRESIDENT MALCOLM: It appears to me that that motion will have to be changed or modified to some extent.

DR. DYKSTRA: Mr. President, in view of the fact that I made the

motion to accept the report I should like to say this: When Dr. Cary presented it he simply stated that the report be accepted. I don't think it should be qualified as to whether it is a Committee report or a personal report. It is perfectly satisfactory to me if it is to be accepted simply as Dr. Cary's report. I will make that as a motion.

PRESIDENT MALCOLM: I believe that is a question for you gentlemen to decide, whether you are accepting this report as Dr. Cary's report or whether you are accepting it as the Committee's report. The question was brought up by Dr. Stange.

I believe it would be all right to handle it in this way: that we take a vote on the question and decide whether it be the Committee's report or Dr. Cary's report. I think that would be a fair way to straighten this out. Therefore, I will ask this Association to vote on the question.

All in favor of accepting it as a report of the Committee will signify by saying "Aye"; contrary, "No." The "noes" have it.

I will submit the question as to whether this organization accepts Dr. Cary's report as Chairman of the Committee. All in favor of accepting Dr. Cary's report will signify by saying "Aye"; contrary, "No." I believe the "ayes" have it. It is carried.

PRESIDENT MALCOLM: Under the heading of "Miscellaneous Transmissible Diseases" we have a subject to be discussed on "Anthrax Protection Tests," by Drs. John Reichel and Joseph E. Schneider, of Glenolden, Pa. (Applause)

DR. JOHN REICHEL: The matter I am going to report under the title of "Anthrax Protection Tests" reflects some work dating back more than twenty years. I personally have been interested in the subject of anthrax and anthrax tests, vaccine tests, for more than that period.

. . . Dr. Reichel read the paper. . . .

ANTHRAX PROTECTION TESTS

By JOHN REICHEL *and* J. E. SCHNEIDER

*Mulford Biological Laboratories, Sharp & Dohme
Glenolden, Pennsylvania*

To the animal husbandman, anthrax, as a disease, presents a menacing, economic problem. Aside from the losses in live stock, there is the additional concern of the infected premises and the potential danger arising therefrom. The disease in animals must be combated by preventing its extension from infected animals and premises. The effectiveness of complete destruction by burning of the carcasses and abandonment of the infected premises is well known.

We do not have a complete knowledge of the factors having to do with the persistence of the infection in certain localities, and the development of the disease in one or more animals to epizootic proportions.

Stockmen, therefore, are obliged to deal with this menace in various ways, depending upon the phase of the problem which appears most critical. Many are confronted first with the task of combating an active outbreak and under such circumstances two questions arise:

- (a) What can be done to control the spread of the disease?
- (b) What can be done to prevent the disease?

In an outbreak with animals becoming infected, others with symptoms, and some dead, sanitation by the burning of dead animals is orthodox. The treatment of sick animals, of sufficient value, with potent antianthrax serum, in appropriate doses, has proven of value. The use of the serum can be extended to exposed animals to assist in the control of the outbreak. However, when the outbreak in any given area has subsided, the owners of live stock on the infected and adjoining premises are confronted with the question of prevention.

Prevention involves the sole question of protection without risk or uncertainty.

Anthrax as a disease in animals can be prevented by avoiding all exposure. This in itself is impractical, particularly in areas where the infection has long existed. Animals in such areas may become exposed to the infection and the chance that any will resist it depends upon the virulence and amount of the infection taken in, in proportion to the degree of resistance on the part of the animal. Many questions arise in considering the factors related to infection as against protection.

It is a comparatively rare occurrence that one hundred per cent of the exposed or infected animals in an outbreak actually die of the disease. Resistance to the infection varies considerably in individual animals. Nevertheless, a virulent infective dose can be prepared for small experiment animals such as the white mouse, guinea pig and rabbit, also sheep, cattle and horses, that will result in killing all injected. Such an infective dose is an overwhelming dose for the animals under test and much larger than the exposure invariably met with under natural conditions. It has not yet been possible to increase the resistance of animals under test, so that all will resist an infective dose which will in itself kill all of the control animals. To measure increased protection or resistance in the prophylactically treated animals it is necessary to use an infective dose which will not kill all of the controls.

Considerable difficulty is experienced in the selection of an anthrax culture of a degree of virulence which in a uniform dose

TABLE I—*Infective dose tests on sheep (3-28-32 to 10-14-32).*

SHEEP	FROZEN BOVILLON ANTHRAX CULTURE 1864		RESULTS (DAYS)														DIAGNOSIS	DEATHS
	DILUTION	DOSE (cc)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	ANTHRAX	(%)
3	Undiluted	1	—	3	1	—	1	1	—	—	—	—	—	—	—	—	+	100
2	1:1	1	—	—	1	2	—	—	—	—	—	—	—	—	—	—	+	100
5	1:10	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	+	80
2	1:30	1	—	—	—	2	1	—	—	—	—	—	—	—	—	—	+	50
3	1:60	1	—	—	—	1	2	1	—	—	—	—	—	—	—	—	+	100
6	1:80	1	—	—	—	1	3	—	—	1	—	—	—	—	—	—	+	50
15	1:100	1	—	—	—	1	3	3	—	—	—	—	—	—	—	—	+	80
6	1:120	1	—	—	—	2	2	—	—	1	—	—	—	—	—	—	+	100

will cause a fatal infection in practically all of the experimentally infected animals.

Our anthrax stock culture 1864 is virulent for the small experiment animals and possesses a distinct pathogenicity for sheep. We have succeeded in growing and storing the culture so that repeated infectivity tests can be made with the same subcultures with a marked degree of uniformity in the results obtained. The seed culture is planted in nutrient bouillon and incubated at 37° C. for 15 hours, 25 per cent normal horse serum is then added to this subculture which is immediately transferred into 50-cc bottles and frozen, by storage at -10° C. Upon removing one of the 50-cc bottles from cold storage, the frozen culture is allowed to thaw out slowly at room temperature and used within several hours.

From March 28, 1932, to October 14, 1932, forty-two sheep were injected with this subculture in undiluted and diluted doses, with dilutions as high as 1:120, with 34 deaths from anthrax and eight survivals. This culture was used as the infective agent in all the tests described in this paper.

The resistance of an animal to the disease can be actively increased by prophylactic treatments consisting of one or more injections of potent biological products. For active immunization, anthrax vaccines consisting of live spore cultures, possessing only a limited infectivity for the small experiment animals, are used extensively. The vaccines are kept and tested for their limited infectivity on laboratory animals, thus proving their harmlessness for the larger animals. The tests, however, do not indicate the potency of the product. Only a protection test, and preferably one on animals of the size of sheep or larger, will indicate whether or not treated animals have greater or less resistance, as compared with the control animals.

Prior to and simultaneously with our efforts to establish the infective dose with anthrax culture 1864, we tested a number of other anthrax cultures and selected stock culture 1974 because of its distinctive antigenic properties. The culture in the biochemical tests with dead bacilli gave a high agglutinin and carbohydrate titre, held as essential in the selection of a strain for the production of a product capable of imparting an appreciable increase in the resistance to anthrax of the injected animal. The culture grows readily on the surface of solid culture media. The spores are kept at a minimum during the growth period of approximately 72 hours at 43° C. The mass of anthrax bacilli can be suspended in normal salt solution, with a reagent fixing and killing the bacilli.

from stock culture 1536 consisted of approximately 1,500 million bacilli per cc. Each cubic centimeter included 0.07 mg of nitrogen equivalent to 0.43 mg of protein. Each cubic centimeter also included some S.S.S., inasmuch as the supernatant was a part of the product.

The relationship of these substances is shown in table II as used on the groups of sheep in the anthrax protection test (table III).

The potency of the various substances singly or in combination can be determined only by protection tests and then preferably when all are tested simultaneously on a comparable basis or within a small dosage range as included in the test shown in table III.

TABLE III—Anthrax protection test on sheep (4-6-32).

GROUP	SUBSTANCE	IN- TERVAL	INFECTIVE DOSE	TOTAL SHEEP	RESULTS*
1	AA 5 cc subcut.	30 days	1 cc of a 1:100 dilution of a frozen bouillon anthrax culture 1864, 5-6-32	5 1	Living (83.3%) Dead (16.7%)
2	AA+SSS 5 cc subcut.			3 3	Living (50%) Dead (50%)
3	SSS 5 cc subcut.			4 2	Living (66.7%) Dead (33.3%)
4	AA+SSS+AAS+P 10 cc subcut.			5 1	Living (83.3%) Dead (16.7%)
5	AA+P 5 cc subcut.			4 2	Living (66.7%) Dead (33.3%)
6	AAS+P 10 cc subcut.			1 5	Living (16.7%) Dead (83.3%)
7	P 5 cc subcut.			1 5	Living (16.7%) Dead (83.3%)
8	SSS+C 5 cc subcut.			4 2	Living (66.7%) Dead (33.3%)
9	AAS 5 cc subcut.			4 2	Living (66.7%) Dead (33.3%)
10	LAV+SSS 2 cc subcut. 5 cc subcut.			3 2 1	Living (100%) Living (66.7%) Dead (33.3%)
11	Controls			2 10	Living (16.7%) Dead (83.3%)

*All deaths from anthrax.

A.A., as tested on sheep (table III, groups 1, 2, 4 and 5), proved actively antigenic to the extent of increasing the resistance of sheep to the infective dose to an appreciably high degree.

S.S.S., tested on groups 2, 3 and 8, singly or with other substances, also increased the resistance but proved less antigenic than A.A., and there were indications that S.S.S. in combination with A.A. (group 2) influenced and lessened the potency of A.A.









A.A.S., tested on group 9, also used in combinations on groups 4 and 6, showed the serum in itself was a potent protective product. It is noteworthy that the passive protection by the serum was in evidence in the sheep injected, for 30 days or more. In combination with the other substances (group 6), however, its protective value was lost entirely.

The P. substances, consisting of the precipitate formed by S.S.S. and A.A.S., used on groups 4, 5, 6 and 7, tested negatively, and aside from being unable to attribute any potency to it, there were indications also that P. influenced negatively some of the other potent substances (group 6).

Group 10, injected with 2- and 5-cc doses of L.A.V., showed a high degree of protection. No clear-cut explanation can be given for the death of one of the 5-cc-injected sheep on the 19th day. While it may have been in part due to the age and condition of this sheep, there is the possibility that the S.S.S. associated with L.A.V. may have a negative effect in the larger dose.

The results with the infective dose on the control sheep in group 11 supports the results recorded in table I.

TABLE IV—Substances used in anthrax protection tests (table V).

GROUPS	A ANTIGEN	B BACTERIN	C VACCINE	D CONTROL
AA = ANTHRAX ANTIGEN (KILLED BACILLI)	 PROTEIN 1.02 MG PER CC	 1500 MG PER CC		
SSS = SPECIFIC SOLUBLE SUB. (carbohydrates)		 PROTEIN 27.5 MG PER CC		
NS = NORMAL SERUM				PROTEIN 0.43 MG PER CC
B = BROTH (CULTURE MEDIUM)				
LAV = LIVE ANTH. VACCINE (Spore Culture)			 1500 MG PER CC	

Before continuing with additional protection tests to establish the degree and length of time the protection would last with properly prepared killed antigen, and a live spore vaccine, we proceeded to test the preparations referred to in table IV.

Anthrax Antigen 65204: Each cubic centimeter includes 0.26 mg of nitrogen per cc, or the equivalent of 1.62 mg of protein and a count of approximately 25,000 million organisms per cc. Being sterile, the antigen is incapable of infecting large or small animals.

Anthrax Bacterin M.M. 9682: Each cubic centimeter includes 4.41 mg of nitrogen per cc, or the equivalent of 27.5 mg of protein and a count of approximately 1,500 million organisms per cc. The high protein content is accounted for by the presence of normal serum and culture media. The product is sterile and non-infective for animals.

Anthrax Vaccine (Southern) 53396: Each cubic centimeter includes 0.07 mg of nitrogen per cc, or the equivalent of 0.43 mg of protein and a count of approximately 1,500 million organisms per cc. The vaccine is a live spore suspension, capable of infecting white mice, guinea pigs and young rabbits, but not sheep or horses, mules or cattle.

Three different strains of anthrax cultures entered into the production of the three products and no attempt was made to standardize these products to each other.

The protection tests conducted on the three products are recorded in table V.

Five of the six sheep injected with 2-cc doses of anthrax antigen survived, as did all six injected with 4-cc doses, indicating that a more dependable protection is obtained with 4-cc than with 2-cc doses.

The deaths with anthrax bacterin, four dying and two surviving on the 5- and 10-cc doses, aside from indicating a negative result, supports the deduction that the sheep were less resistant than the controls when the infective dose was injected.

The sheep injected with anthrax vaccine (southern) in 2-cc doses showed one death and five survivals, and in this respect the results are identical with those obtained with 2-cc doses of anthrax antigen.

The results with the infective dose on all of the sheep are shown in table VI.

More deaths occurred by the seventh day among the sheep injected with anthrax bacterin than among the controls, and in addition the death-rate between the 5- and 10-cc dose supports the deduction that the larger amount resulted in no greater pro-

TABLE V—*Anthrax protection test on sheep.*

SHEEP	SUBSTANCES INJECTED SUBCUTANEOUSLY 10-13-32		INTERVAL	INFECTIVE DOSE	RESULTS	
	GROUP	DOSE (cc)			DAYS	SURVIVED (%)
1	A Anthrax antigen	2	30 days	1 cc of a 1:80 dilution of frozen bouillon anthrax culture 1864. Injected subcutaneously 11-12-32	L-14	83.3
2		2			L-14	
3		2			D- 7	
4		2			L-14	
5		2			L-14	
6		2			L-14	
7		4			L-14	100
8		4			L-14	
9		4			L-14	
10		4			L-14	
11		4			L-14	
12		4			L-14	
13	B Anthrax bacterin	5			L-14	33.3
14		5			D- 3	
15		5			D- 4	
16		5			D- 5	
17		5			D- 7	
18		5			L-14	
19		10			D- 6	33.3
20		10			D- 3	
21		10			D- 3	
22		10			D- 5	
23		10			L-14	
24		10			L-14	
25	C Anthrax vaccine	2			L-14	83.3
26		2			L-14	
27		2			L-14	
28		2			D- 8	
29		2			L-14	
30		2			L-14	
31	Controls				D- 3	58.3*
32					D-10	
33					D- 6	
34					D- 5	
35					L-14	
36					D- 4	
37					D- 7	
38					L-14	
39					L-14	
40					L-14	
41					L-14	
42					D- 4	

*Percentage of deaths.

TABLE VI—Summary of results of infective dose injected 11-12-32. (See table V.)

SHEEP	ANTHRAX PRODUCTS INJECTED SUBCUT- ANEOUSLY, 10-13-32		RESULTS (DAYS)														DIAGNOSIS
	Group	Dose (cc)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
6 6	A Antigen	2	—	—	—	—	—	—	1	—	—	—	—	—	—	—	Anthrax*
		4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
6 6	B Bacterin	5	—	—	1	1	1	—	1	—	—	—	—	—	—	—	Anthrax* Anthrax*
		10	—	—	2	—	—	—	—	—	—	—	—	—	—	—	
6	C Vaccine	2	—	—	—	—	—	—	—	1	—	—	—	—	—	—	Anthrax*
12	D Controls		—	—	1	2	1	1	1	—	—	1	—	—	—	—	Anthrax*

*Diagnosis of anthrax confirmed by cultural test of heart-blood.

tection. There are some indications that the 10-cc sheep had less resistance than the 5-cc sheep and the controls.

A majority of the control animals, that is, seven out of the twelve, died of anthrax.

CONCLUSIONS

1. It is possible to establish an infective dose for sheep with a virulent anthrax culture of value in the protection test.
2. Such a sheep protection test will reveal the relative protective value of anthrax antigen, anthrax vaccine (southern) and anthrax bacterin. It will also permit of the test for potency of antianthrax serum.
3. Anthrax antigen and anthrax vaccine (southern), so tested, increased resistance in the sheep injected 30 days prior to the administration of the infective dose.
4. Anthrax bacterin, as used in the tests, failed to increase the resistance of the sheep.
5. Additional sheep-protection tests with the same infective dose should be made with anthrax antigen and anthrax vaccine (southern) to establish further the lasting qualities of the immunity.

DISCUSSION

DR. FRANK BREED: Dr. Reichel is to be complimented on the extensive amount of work he has done. His conclusions are logical. Furthermore, if we are able to produce a product which will give the high percentage of protection which he has demonstrated has occurred in this test, we are very fortunate in having that product developed at the present time. As those who have been in anthrax work in the past years know, the products which we have had for controlling the condition have not been entirely satisfactory.

If a sterile or a non-infective product can be produced, that is going to lead more to the control of anthrax in our district than anything else. I wish to take the opportunity at this time of again complimenting Dr. Reichel on the piece of work he carried out.

DR. REICHEL: I should like very much to let all of you know that I had a very distinct purpose in presenting this. I am not appearing before you with the idea of launching antianthrax antigen. Don't draw that deduction. I am particularly impressed with the results of the substances that we tested out, as shown in table II. A study of that table, when you get the printed paper, I think is well worth while, because it gives us, I think, for the first time, some very interesting ideas relative to the support of certain practices in which we have been indulging for years, namely, the addition of serum to either live spore vaccine, or injected simultaneously or alone, one and then the other. The logic in back of many of those procedures is certainly very much to be questioned. If you think of some of those problems and you study that table, you will get the answer to some of your questions. There isn't any sound reasoning in back of the use of anti-anthrax serum with anthrax antigens, live or dead, bacterins or otherwise, at the same time, because that specific soluble substance (and I have used a very broad term there) or substances include a number of active ingredients, agglutinogens, precipitins, carbohydrates or poly-

saccharids. They all have a tendency to take out of the anthrax serum its potent substance and make it worthless.

Furthermore, it will actually break down the resistance of an animal that has received such a serum simultaneously or immediately after the injection of the anthrax product. That was one of the reasons I wanted to get before you men, who are asked so many questions when an epizootic occurs, what to do in the midst of an outbreak and what to do in the way of prevention. Many recommendations are made, but when you sift the ground on which they are based there is no sense to them. This work has a very broad significance in that direction. It would be well worth while going over at your leisure. I shall be very glad to answer any questions.

DR. C. H. HAYS: Have you made any observations on the increased susceptibility that might be occasioned immediately following the introduction of the aggressin?

DR. REICHEL: I can answer that from the deductions made on the results reported here. From our studies, aggressin, if an attempt is made to make it in the culture tube, consists essentially of the specific soluble substances I am talking about; if it comes from the animal, it contains exudate, that is, the specific soluble substance is associated with protein particles in that exudate. From our point of view, only one thing can happen, that is, you get a decreased resistance following the injection.

As to the amount of protection one gets later, it depends upon the length of time that you wait. The balance that happens to be in that combination which is antigenic is such a varying quantity that we cannot control it. Originally, when we started out with this work, we hoped we could take the specific soluble substance, which we were rather keen about, and balance it so that we would get protection with a clear solution. That is why we took the carbon particles. We thought we could associate the polysaccharids in the specific soluble substance with the carbon, but it requires a very careful balance. We have used several hundred rabbits in the test. We can get protection but we cannot balance it properly. The end-result invariably is to lessen resistance after injection. The animals are more susceptible.

There is another interesting angle coming up in connection with this work which caused us to think a lot, and we are giving that phase of it some study, the protein embodied in these dead organisms. We injected a dose directly into the skin, the intradermal method, so-called. I am not discussing the merits of the test. We injected some of the antigen, killed organisms, directly into the skin of susceptible horses. Very much to our amazement we got a beautiful swelling. We always looked upon swelling at the point of injection as an indication that the live organisms were getting in their licks and were causing the reaction at the site of injection. Here you have the same reaction. Dr. Schneider happens to have with him a photograph of one of the horses that was given a neck dose. There is a beautiful swelling, typical of what we have been getting with live vaccine culture. So this antigen, this protein, certainly is highly specific and does cause that particular reaction on the skin.

DR. HAYS: In the recent outbreak we had a similar experience, apparently, through the use of an antigen, with a dead horse in one instance, five animals in another instance, and one in another instance, which were quite a distance removed from any known infection at the time. It occurred only in the instance of horse inoculation.

I might ask one further question of Dr. Reichel. Has this same effect of lowered resistance been observed in the instance of the spore vaccine immediately following inoculation where there is exposure?

DR. REICHEL: Yes.

PRESIDENT MALCOLM: Is there any further discussion? If not, Dr. A. W. Miller, Chairman of the Committee on Miscellaneous Transmissible Diseases, has kindly consented to make his report.

. . . Dr. Miller read the report. . . .

REPORT OF COMMITTEE ON MISCELLANEOUS TRANSMISSIBLE DISEASES

DR. A. W. MILLER, *Chairman*, Washington, D. C.

Dr. Jacob Traum, Berkeley, Calif.

Dr. Edward Records, Reno, Nev.

Dr. H. C. Givens, Richmond, Va.

Dr. C. C. Hisel, Oklahoma City,

Dr. H. M. Martin, Philadelphia,

Okla.

Pa.

Dr. W. A. Hagan, Ithaca, N. Y.

The report of your Committee for this year is confined to a discussion of the current situation with respect to encephalo-myelitis of equines, foot-and-mouth disease, vesicular stomatitis, and anaplasmosis.

ENCEPHALO-MYELITIS OF EQUINES

Last year this Committee reported at considerable length on this disease, which had then been prevalent for two successive years in the Pacific Coast and adjoining areas. During 1932, the disease recurred in the same territory and also extended itself rapidly. By last fall, well authenticated outbreaks of considerable extent had been reported as far south as Texas and to the east in South Dakota. With the onset of colder weather in the fall, the disease again subsided.

In addition to involving new territory, previously infected districts were involved again. In some of these, cases were more numerous than in 1931 and in others less so. In some of the previously involved districts there seemed to be an increase in virulence, in others a decrease.

Little or no definite light has been shed on the means of this rapid extension of the disease. In no instance does it appear to have been traced definitely to the movement of hay or other plant or animal products. On the other hand there are reports from California, Oregon and Arizona which indicate that the disease has been carried long distances by apparently normal horses moving from infected to non-infected districts.

The actual mechanism of natural contagion from horse to horse has not been demonstrated. There may be more than one effective method of infection. The close coincidence of the period of greatest prevalence of the disease with that of the tabanids and other biting insects which attack horses may be significant. If such biting insects are concerned as vectors, however, it seems most probable that their function is a purely mechanical one.

Observation has shown that a previous attack usually confers immunity. Numerous cases were observed in 1932 in animals which were supposed to have survived typical and severe attacks from one to three years previously. Many of these reports may have been based on errors in diagnosis. In some instances, however, the diagnosis of both the first and second attacks does not seem open to reasonable question. Further observations are needed definitely to settle this question.

Considerable progress has been made in developing and refining methods of treatment. Among non-specific measures, artificial support and conservative medicinal treatment of symptoms seem most essen-

tial. The intravenous administration of hypertonic salt solution (15 per cent NaCl) in large doses up to one litre shows promise of being helpful. Drastic purgation by orally and hypodermically administered agents appears to be of doubtful value and probably harmful, though enemas are perhaps helpful.

Workers at the Nevada and California Agricultural Experiment Stations found that a highly potent antiserum could be produced readily and consistently by hyperimmunizing horses.

The results following the use of this serum as a therapeutic agent have on the whole been very encouraging, though dependent largely on the stage of the disease at administration and to a lesser extent on the type of case. When administered intravenously, early in an attack, the death rate is lowered and convalescence in the recovering case greatly shortened. There was also observed a decrease in the number of cases showing permanent impairment of function after recovery. It has been noted, however, that the so-called "bulbar paralysis" type of case does not respond well to the specific serum or any other method of treatment. This serum is now being produced commercially under U. S. Bureau of Animal Industry license.

Some apparent progress has also been made in developing prophylactic measures. Trials of the antiserum referred to for this purpose, though somewhat limited, have been decidedly disappointing. The passive immunity conferred by this serum, if any, appears to be very slight and fleeting. On the other hand, work at the Nevada Station indicates that a substantial immunity can be produced by injecting certain preparations of the virus as antigens. Further work along this line will be necessary, however, to establish the safety of this procedure as a routine method in the field. At the University of California subcutaneous vaccination with one-gram doses of glycerinated horse brain from artificially produced cases has been found to produce a solid immunity, but this dosage is too dangerous for field use, since the method produced fatal results in one case out of six so vaccinated.

The continued and rapid spread of this disease with its potentiality of enormous damage, especially in areas of dense horse population, prompts us to urge again its intensive study. Information as to means of dissemination and transmission plus adequate methods of control in infected districts appears to be urgently needed. If the disease continues to occur in 1933, restriction of the movement of horses from infected districts during the months of July, August and September may be advisable in order to prevent the spread of the disease to the middle western and eastern states.

FOOT-AND-MOUTH DISEASE

Foot-and-mouth disease was diagnosed officially on April 28, 1932, among hogs in a large feeding-plant in Orange County, California. This was the tenth recorded outbreak of this disease in the United States. As a result of vigorous and effective action on the part of the coöperating forces of state, county and federal employes, this outbreak was of shorter duration than any that has occurred in this country in the past forty years, but ten days having elapsed from the time the diagnosis was made in the first infected herd to the time that the last diseased herd was slaughtered. The work of eradication included the slaughter of 46 cattle, 18,747 swine, and 24 goats, with an appraised value of \$203,328.60.

Noteworthy of mention in connection with this outbreak is the fact that only swine were infected, inoculation tests of several cattle and also a number of guinea pigs having failed to develop lesions of the disease. This is in line with the experience that authorities

in Germany have had, where it is reported that in two outbreaks of the disease practically all the cases were confined to swine.

Just how the disease was introduced is unknown, as investigations which were made failed to develop any definite information as to the probable source of infection in this instance.

VESICULAR STOMATITIS

Outbreaks of vesicular stomatitis have been reported as occurring in a number of states during the present year. The most extensive one was in Virginia, where the disease made its appearance about August 15 and was at its height for about thirty days, during which time numerous herds in about a dozen of the southwestern counties of the State were affected. In many of the herds only a few of the animals developed symptoms of the disease but in one or two instances infection manifested itself in as many as forty per cent of the animals.

Inoculation tests that have been made by the federal Bureau of Animal Industry over a period of years have demonstrated rather definitely that there are at least two types of this disease that have occurred in the United States. One has been designated as the New Jersey type and the other as the Indiana type. The outbreak in Virginia apparently was of the New Jersey type, as guinea pigs inoculated with virus from the Virginia outbreak, which were immune to the Indiana virus, developed well-marked lesions, while none of those immune to the New Jersey type did. This disease is of particular importance to live stock sanitary officials and practicing veterinarians because of the similarity of its lesions to those of foot-and-mouth disease.

Your Committee is bringing it to your attention at this time simply to stress the importance of an immediate and thorough investigation of outbreaks with lesions symptomatic of foot-and-mouth disease, with the view of determining definitely with as little delay as possible the true nature of the affection which, with our present knowledge, apparently can be accomplished only through inoculation tests applied not only to domestic ruminants and swine but also to horses. The latter species, as most of you are probably aware, has been found at least in this country to be immune to foot-and-mouth disease but highly susceptible to vesicular stomatitis.

ANAPLASMOSIS

Research studies of this disease have been continued during the present year. The Oklahoma A. & M. College and the federal Bureau of Animal Industry, which are coöperating in a study of this disease, carried on some work on horse-fly transmission at the Oklahoma Experiment Station. Eight experiment cows became infected with the disease from the bites of four different species of horse flies. Four of these animals died; the others recovered. Each cow was bitten by a single species of fly after having fed on an infected animal. In another experiment at that station two animals were infected by the intradermal method of injection, using the caudal fold as the seat of injection. One animal received 0.25 cc of blood from an acute case; the other 0.5 cc of blood from a carrier animal. The period of incubation was approximately one month in each case.

Although most investigators believe that infected animals remain carriers throughout life, tests carried out at the Bethesda Experiment Station indicate that in one known carrier cow the carrier state had apparently disappeared after about four years. Splenectomized dogs inoculated with anaplasmosis blood were not found to be har-

boring the infection when tested two months later. It would appear from this that dogs do not serve as reservoirs of the virus.

DR. MILLER: Mr. President, I move the adoption of this report.

. . . The motion was seconded, put to a vote, and carried. . . .

PRESIDENT MALCOLM: Gentlemen, that ends the program for this session.

. . . The session adjourned at 12 noon. . . .

RECESS

THURSDAY AFTERNOON, DECEMBER 1, 1932

The fourth session convened at 1:35 p. m., President Malcolm presiding.

PRESIDENT MALCOLM: Your Executive Committee instructed me to appoint a Nominating Committee. I have appointed Dr. T. E. Robinson, State Veterinarian of Rhode Island, Chairman; Dr. C. G. Lamb, State Veterinarian of Colorado, and Dr. M. F. Barnes, Director of Laboratories, Pennsylvania Bureau of Animal Industry.

The next order of business on the program is a paper, "Studies on the Control of Johne's Disease," by Drs. W. A. Hagan and Alexander Zeissig, Department of Pathology and Bacteriology, New York State Veterinary College, Cornell University, Ithaca, N. Y. (Applause)

. . . Dr. Hagan read the paper. . . .

STUDIES ON THE CONTROL OF JOHNE'S DISEASE

*By W. A. HAGAN and ALEXANDER ZEISSIG**

Department of Pathology and Bacteriology

New York State Veterinary College, Ithaca, N. Y.

The necessity of controlling paratuberculosis, or Johne's disease, in this country is a problem of greater importance than many realize. It is only when one visits the British Isles, or any one of a number of countries of continental Europe, and observes the ravages of the disease there that he develops an appreciation of how fortunate is the cattle industry of this country that the disease is not more prevalent here. Unless control officials arouse themselves and attack the problem soon, however, it will be only a matter of a half-century or less until we will be faced with a situation with respect to this disease as serious as that which now confronts our European neighbors. The disease has been diagnosed definitely in at least two-thirds of the states of this country. In all but a few of these the disease has not spread seriously but it has a foothold and may be expected to spread from numerous centers as the years go on.

As in the case of tuberculosis, this disease spreads, practically speaking, in only one way and this is in the traffic in

*Dr. Harriet M. Thomson, Dr. W. Taylor Miller and Mr. D. W. Bruner have rendered material assistance in various stages of this study, and to them we wish to acknowledge our indebtedness.

diseased cattle. It came into this country in this way from Europe and has spread and is now spreading from herd to herd and state to state in this way. Unfortunately, the disease is very insidious, much more so even than tuberculosis. The incubation period is longer, the symptoms less characteristic, and the postmortem lesions much less striking. There can be no doubt about the fact that the disease now exists in many places where it has not been recognized.

There seem to be only two possible methods for the control of this disease. The first is the development of a satisfactory procedure for the early diagnosis of the disease, to the end that traffic in animals in the incubation period may be stopped. The second is the development of a vaccination procedure by which exposed animals can be protected from the infection. We should turn our attention first to the former procedure and resort to vaccination methods only when it becomes evident that successful diagnostic procedures are not available.

With funds made available by the State of New York, we have been studying Johne's disease with special reference to control measures for several years. An experiment herd was established six years ago and in this herd we have accumulated much of the data given in this paper. We have not attempted to control the disease in this herd but have merely observed its behavior. Periodic diagnostic tests have been made, and in this way we have obtained rather definite ideas as to their reliability. We have also applied the diagnostic tests to a considerable number of privately owned, naturally infected herds.

THE EXPERIMENT HERD

This herd was established in the fall of 1926. Beginning with three animals, it was gradually built up by purchases and natural increases to about thirty animals. Infection was introduced by means of the addition of naturally infected animals, and by drenching of calves with infective material obtained from outside herds. The animals have been housed together and allowed to run in a small pasture.

In this herd, since the fall of 1927, we have had fifteen animals die of Johne's disease, six infected animals were slaughtered before they showed any evidence of the disease, and we have at least ten animals now which are certainly infected, although only three of this number show clinical evidence of the disease. An abundance of infection has existed on these premises during the last three years. There has hardly been a time when there were not several scouring animals present.

These animals have furnished us the opportunity of testing the value of several diagnostic methods. In the earlier years we worked with johnin manufactured both by us and by others, and in later years principally with avian tuberculin made by us. We have also used the complement-fixation test. Periodic tests have been carried out on the entire herd. During the first three years, the tests were conducted at least three times per year; but in the last three years, we have limited our allergic testing to twice per year. The complement fixation test has been carried out at more frequent intervals, since there is no objection to frequent testing with this method.

ALLERGIC TESTS

In this paper we will limit our discussion to the use of avian tuberculin as the diagnostic material. Johnin has been used but, in our hands, it showed no advantages over the avian tuberculin and it has several disadvantages. A comparison of avian tuberculin and johnin as diagnostic agents for Johne's disease has already been published by Hagan and Zeissig.¹ We have tried both of these agents intradermally and subcutaneously but the results did not appear encouraging; hence all of our recent testing has been done with the intravenous method originated by Beach and Hastings.² Much of the work of the first two years cannot be interpreted with certainty because we were working with products prepared differently and some of these obviously were impotent while others were superpotent or were given in too large a dosage. Inasmuch as there are always some animals in the herd known to harbor the infection and others which could reasonably be assumed to be free from it, we could always arrive, after the completion of a herd test, at a fairly definite opinion of the value of the product used. During the last four years, we have used a product which has been fairly standard in strength and we feel that the results have been sufficiently consistent for comparison. The data which will be given later, therefore, will be that of the last four years rather than that of the whole period.

Preparation of avian tuberculin: Our tuberculin is prepared from a typical culture which has been in our possession for some years. The organism is grown on a glycerol-phosphate infusion broth in shallow layers in Erlenmeyer flasks. The cultures are incubated for two months at 37° C. The ripe cultures are removed from the incubator, shaken, steamed in flowing steam for four hours, then filtered through coarse paper to remove the greater part of the bacillary mass. The slightly opalescent fil-

trate is then passed through a thick layer of paper pulp in a Buchner funnel by the aid of a vacuum. The crystal-clear filtrate is then heated in flowing steam for about one hour, preserved by the addition of one-half per cent phenol, and stored till needed. Berkefeld filtration is not done since the Buchner filtrate appears to contain practically no bacilli.

Before using a new lot of this tuberculin in field tests, we have always applied it to our own herd. In the case of several consecutive lots have found that a 10-cc dose given intravenously has no observable effect on normal animals, whereas this dose is sufficient to give a sharp temperature reaction in most infected animals. Animals in advanced stages of the disease frequently do not react to this dosage but this is the case with all test substances which we have tried. Larger doses may elicit reactions in such animals but larger doses are also likely to elicit sharp temperature responses in unaffected animals. It should not be forgotten that both avian tuberculin and johnin possess toxicity for animals and this is true whether these products have been prepared from media having a broth basis or whether they have been prepared from cultures grown on synthetic media (Hagan and Zeissig). The dose of tuberculin mentioned (10 cc) is suitable for a cow of average size, that is, for one weighing from 600 to 900 pounds. For larger animals the dose should be increased proportionally. Young calves may be given a 5-cc dose safely.

Technic and observations on the allergic test: It is our custom to begin the test as early in the morning as is possible. When it is convenient to do so, we frequently take one or more temperatures on the herd during the afternoon of the day preceding the test, in order to obtain an idea as to whether or not all animals in the herd are normal. If the animals have been stanchioned during the night and there are no individual water-cups, all animals are turned out and allowed to drink before the work is begun. In cold weather the animals should not be allowed to drink large amounts of very cold water because their body temperatures will be depressed by such a procedure. In this case, if the herd is not too large, it is best to carry water to each of the animals and give only a little at a time, or give water which has been warmed. Testing in barns where individual water-cups are available is much more satisfactory than when they are absent. In this case the animals are allowed to drink whenever they wish before and during the test.

A single pre-injection temperature is taken in the morning. The tuberculin is warmed to near the temperature of the body

and the bottles are kept in pails of warm water containing a disinfectant when the weather is cold. The injections are made into one of the jugular veins, making certain that the entire dose goes into the vein. It is our custom to plunge the needle into the dilated vein and, when the blood is running freely, to attach the syringe to the slip-needle and introduce the tuberculin. Post-injection temperatures are begun immediately and continued hourly for at least ten hours.

A typical reaction curve begins in from three to five hours after the injection, reaches its peak from the fifth to the eighth hour, and then declines rather rapidly to normal or near normal by the eighth to tenth hour. Occasionally a plateau type of curve is obtained, the decline not occurring till after the twelfth hour.

In the earlier work it was discovered that when weak tuberculin or johnin was used, the temperature curve usually began and reached its peak later than just described. We think that this explains the late reactions obtained by Beach and Hastings. The same thing is true when a part or all of the dose is injected subcutaneously either by intention, or through poor technic when intravenous injection is attempted. On the other hand, when animals are overdosed, sharp temperature responses are apt to occur beginning within an hour after the injection and reaching the peak within three or four hours. This response may be observed in some normal animals as well as in affected ones, and is therefore of no diagnostic value. At the present time we have no way of determining the proper dose of a newly prepared product except by trial on infected and known non-infected animals.

As is true in tuberculosis, animals which are extensively infected with Johne's disease frequently do not react well, or at all, to allergic tests. When carrying on a herd test, therefore, animals which are suspicious clinically should be studied especially and either eliminated on the basis of clinical findings or subjected to other tests. Useful confirming procedures, in these cases, are the examination, microscopically, of bits of mucosa pinched from the rectum, and the complement-fixation test. Microscopic examination of the feces may reveal the characteristic bacilli, but this procedure cannot be relied upon always to show the bacilli even when the animal is very badly diseased. It has been our experience that the most certain confirming test in these cases is complement-fixation.

We interpret a two-degree temperature rise, when the curve follows a typical course, as evidence of a positive reaction. Each

TABLE I.—*Test of John's disease experiment herd, December 31, 1930, with avian tuberculin (a-8) intravenously.*

ANIMAL	Avian tuberculin injected 7:00 to 8:00 a. m.														7 A. M.	8 A. M.	9 A. M.	10 A. M.	11 A. M.	12 M.	1		2		3		4		5		6		INTER- PRETATION	PROBABLE STATUS OF ANIMAL
	P. M.	P. M.	P. M.	P. M.	P. M.	P. M.	P. M.	P. M.	P. M.	P. M.	P. M.	P. M.	P. M.	P. M.							P. M.	P. M.	P. M.	P. M.	P. M.	P. M.	P. M.	P. M.	P. M.	P. M.				
53	1.7		2.0		2.0		2.0		2.0		2.2		2.1		2.2		3.0		2.4		1.8		2.3		2.3		Negative	Not infected						
56	2.1		1.9		2.5		2.9		3.6		3.6		4.3		3.9		3.3		2.9		2.5		2.1		2.1		Reactor	Infected						
57	2.3		2.3		3.4		3.7		3.5		3.5		3.8		3.3		2.7		3.2		2.7		2.7		2.7		Reactor	Infected						
55	1.9		1.7		2.0		2.3		3.1		2.4		3.0		2.8		2.7		2.5		2.6		2.4		2.4		Negative	Not infected						
34	1.6		1.7		2.4		2.6		2.9		2.2		2.4		2.5		2.3		2.8		2.0		1.8		2.1		Negative	Not infected						
1	1.6		1.6		2.2		1.8		2.3		2.2		2.0		1.8		2.3		1.6		2.1		1.8		1.8		Negative	Not infected						
76	3.3		3.3		3.9		4.0		4.3		4.1		3.6		2.8		2.6		2.3		1.4		1.8		1.8		Doubtful*	Not infected						
80	0.4		0.8		1.6		1.0		1.6		1.3		0.8		0.8		0.9		0.5		0.9		0.8		0.8		Negative	Not infected						
59	2.2		2.3		2.5		2.6		2.7		2.7		2.8		2.2		2.1		2.2		2.1		1.5		1.5		Negative	Infected						
33	2.2		2.5		2.0		2.4		2.4		2.7		3.5		4.7		4.4		3.6		2.4		2.0		2.0		Reactor	Infected						
52	2.8		2.8		3.6		3.8		3.4		3.3		3.2		2.3		2.4		2.1		2.3		2.2		2.2		Doubtful*	Infected						
77	2.3		2.9		3.3		3.7		2.7		4.2		4.8		5.3		4.7		3.8		2.9		2.3		2.3		Reactor	Infected						
78	4.0		4.3		4.2		5.2		4.7		6.0		6.3		4.8		4.6		3.9		3.6		3.2		3.2		Reactor	Infected						

Temperatures are expressed in degrees Fahrenheit above 100, i. e., 1.7 equals 101.7°F.

*Reactions considered doubtful because the peak temperatures occurred too early, i. e., between the third and fourth hours, and between the second and third hours, respectively.

case is considered on its merits and this standard is deviated from occasionally. Reacting animals usually develop temperature peaks exceeding 104° C. and frequently they greatly exceed this point. One can use the same principles to guide him in interpreting these tests as he uses in interpreting the results of the subcutaneous tuberculin test.

In the course of the reaction, affected animals nearly always show physical signs. In some of our early work we frequently saw rather alarming symptoms soon after the injections were made, and such have been described by Beach and Hastings. These have not been seen in the course of several thousand injections during the last three years. We have been more careful during later years to have our test fluid warmed, and are inclined to think that some of the striking reactions in our earlier work were due to the injection of cold fluid.

The signs which we have seen in later years consists of mild depression, in the course of which the animal stands with lowered head and refuses food when it is offered, a staring coat, muscular tremors, and active scouring. Many animals show nothing more than signs of depression which usually pass away as soon as the peak temperature has been passed. Scouring occurs only in a few animals. Sometimes affected animals, which have never scoured previously, begin to do so about the time the temperature begins to rise. Scouring may cease soon after the temperature returns to normal, but frequently it continues for several days.

A typical test chart of our experiment herd is given as table I. This chart is a random selection of many. The data on the "probable status of the animal" were added to the chart nearly two years after the completion of the test and are based upon all the information in our possession. Inasmuch as none of the animals were slaughtered immediately after the test, and some of them are still living, two years afterward, we cannot be more definite.

It is to be noted that the peak of the fever curves was reached by all the clear-cut reactors at the end of the fifth and sixth hours after injection and that by the tenth hour all of the temperatures, except that of 78, had fallen to normal levels.

Sometimes, apparently more often in warm than in cold weather, and more often in young than in old animals, the temperature curve, after remaining at or near the normal level for eight hours or more after injection, will then begin to rise. In any large herd one or two curves of this sort are likely to be found. At first we regarded these reactions as specific but we

do not do so now. We wish to point out carefully, however, that the interpretation of these later reactions depends upon the knowledge which the operator has of the test fluid which he is using, and the certainty which he possesses that the test fluid was actually introduced into the vein. When it is known that the particular tuberculin used induces peak reactions at the fifth to eighth hours, reactions beginning as late as the eighth hour may be properly ignored. We do not know the cause of these belated reactions. Some examples are given in a composite test chart given as table II. In this chart, instead of actual hours, the pre-injection temperature is given in the column designated as "-1" and the post-injection in hours following the time of injection.

Reliability of the allergic test: In only a few instances have we slaughtered animals immediately after they have reacted allergically. Under these conditions it is impossible to be perfectly certain that an animal harbored, or did not harbor, the infection at the time of a particular test. Looking back at the history of an animal several years later, however, one can get a reasonably accurate idea of the status of any particular animal, with respect to the disease, and can judge whether the successive tests reflected an accurate picture. We have already said that the test conducted during the first two years of the herd-testing cannot be interpreted accurately because of the use of varying testing fluids. Beginning with 1929, however, we have used a standard testing fluid, and it is from this date that we begin to report our results in this paper. In table III we give nine consecutive allergic tests on 20 animals in our herd. Not all tests are given but the material has not been selected and it is thought that we are giving a fair cross section of our results.

We believe that the results of these tests are reasonably consistent. In spite of the fact that the tests were rather closely spaced and later tests probably were influenced by the preceding ones, it will be seen that reacting animals usually continued to react on succeeding tests and non-reactors continued to be non-reactors up to the time they contracted the infection. Occasionally apparent reactions were obtained in animals which previously and subsequently did not react. These reactions may have been false, or they may indicate that animals sometimes develop slight infections from which they recover. That such a thing can happen we have rather definite evidence. In some cases animals failed to react on single tests when they had reacted earlier and did so subsequently. These test failures may be due to close

TABLE II—Composite test chart. Delayed or false reactions.

ANIMAL	-1	Avian tuberculin intravenously										PROBABLE STATUS OF ANIMAL	
	1	2	3	4	5	6	7	8	9	10	11	12	
19	2.2	3.8	2.9	2.4	2.8	2.1	2.4	2.1	2.4	3.3	4.1	4.1	Not infected*
12	1.9	1.7	1.5	1.4	1.7	2.5	2.5	3.4	2.9	3.6	3.7	3.8	Not infected
10	2.2	1.7	1.0	1.6	1.8	2.1	2.5	3.6	3.5	3.8	4.3		Not infected
91	2.2	2.0	1.7	2.1	2.1	2.2	2.6	2.5	4.3	4.8	5.1		Not infected
28	3.3	3.0	2.6	2.7	2.4	2.8	2.7	2.6	—	3.6	3.9		Not infected

*All of these animals, with the exception of 91, have been slaughtered and found not to be infected. No. 91 shows no evidence of infection either clinically or by subsequent allergic and complement-fixation tests.

TABLE III—Results of consecutive semi-annual allergic tests on a group of animals in the experiment herd.

ANIMAL	ALLERGIC TESTS									COMMENTS ON ANIMALS
	1ST	2ND	3RD	4TH	5TH	6TH	7TH	8TH	9TH	
1	+	+	?	-	-	+	-	-	-	Animal affected with clinical J. D. during first year. No symptoms thereafter. Alive and well
11	+	-	-	-						Inoculated (J. D.) intravenously just before first test. No symptoms. Autopsy after last test—negative
12	?	-	-	+						Inoculated (J. D.) intravenously just before first test. No symptoms. Autopsy after last test—negative
16	-	+	+	+						Died of J. D. shortly after last test
29	+	-	-	?						Destroyed immediately after last test. Slightly infected
31	+	-	+							Died of J. D. 6 months after last test. Symptoms appeared about time of second test
33	-	-	-	+	+	+	+	-	-	Alive. Advanced J. D. Showed symptoms immediately after 7th test
34	-	-	-	-	-	+				Showed symptoms 4 months after last test and died of J. D. two months later
41	-	-	-	-						Slaughtered. No evidence of J. D.
42	-	-	-	-						Slaughtered. No evidence of J. D.
43	-	-	-	-						Slaughtered. No evidence of J. D.
49	-	-	-	+						Slaughtered. Slightly infected
50	-	-	-							Slaughtered 5 months after last test. Slightly infected
52	-	-	-	+	?					Developed symptoms 4 months after last test. Died of J. D. 2 months later
53	-	-	-	-	+	+	-	+		Alive. Advanced J. D. Showed symptoms just before 7th test

J. D. = Johne's disease.

TABLE III—Results of consecutive semi-annual allergic tests on a group of animals in the experiment herd—Concluded.

ANIMAL	ALLERGIC TESTS									COMMENTS ON ANIMALS
	1ST	2ND	3RD	4TH	5TH	6TH	7TH	8TH	9TH	
55	—	—	—	+						Shown symptoms and died of J. D. within three months after last test
56	—	+	+	+	+	+	—			Alive and apparently well. Has never shown any symptoms of disease. Does not react to complement-fixation test
59	—	—	—	—	—					Shown symptoms 5 months after last test and died of J. D. within a month
77	+	+	+	+	+					Alive. Advanced J. D. First showed symptoms just after third test
78	+	—	+	+	?					Artificially infected (drenched) 4 months before first test. Alive. Has never shown any symptoms

spacing of the tests. We have no evidence that any of the consistently negative animals have harbored Johne's disease, and all consistently positive animals which have come to autopsy have shown evidence of the disease. A number of our consistently positive animals have become negative at about the time that symptoms have appeared.

CONTROL STUDIES ON NATURALLY INFECTED HERDS

As the opportunity has presented itself, we have extended our studies to attempt to eliminate the infection from privately owned, naturally infected herds. A number of herds have been tested in New York by us, and we have furnished the testing fluid and have conducted the laboratory work in connection with reacting animals in a considerable number of herds in other states, the conducting of the actual tests in these cases being left to others. Inasmuch as indemnity is not being paid in New York for reacting animals, we have not always been able to induce the owners to slaughter normal-appearing animals because they have reacted to the test and thus have not been able to carry on the studies of the control of the disease as we would have liked. We have obtained satisfactory coöperation in eighteen herds, however, and are reporting the results in table IV.

It should be pointed out here that the majority of the herds reported in table IV are still under supervision, and we do not feel any certainty that the disease has been eradicated except perhaps in herds 3, 5, 8 and 9, where two or more negative tests have been obtained. In two of these cases, the herd has been free of clinical cases for more than two years and the probability is good that the disease has actually been eliminated.

Our experience is in agreement with that of Beach and Hastings, that it is more difficult to eliminate Johne's disease from a herd by a testing program than in the case of tuberculosis. In herds 15 and 18, little progress is evident after several semi-annual tests.

The cause of this persistence of the infection in some herds in spite of the active prosecution of a testing program may be ascribed to one of two things: either infected animals are being missed by the tests or the infection is able to persist in spite of the usual disinfecting processes, and thus to infect animals later. We have no data on the real situation here. It is customary to ascribe it to the missing of infected animals but it seems to us that the other reason may really be playing a large rôle. It does not seem likely, considering the peculiar growth requirements of the organism of Johne's disease, that it could

TABLE IV—Reactors obtained on repeated semi-annual tests for avian tuberculin.

HERD DESIG- NATION	NUMBER OF ANIMALS IN HERD (APPROXIMATE)	FIRST TEST	SECOND TEST	THIRD TEST	FOURTH TEST	FIFTH TEST
1	25	8	0			
2	24	1	1	0		
3	15	1	4	0	0	
4	25	4	2	1	0	
5	30	7	4	0	0	
6	14	3	2	0		
7	40	4	4	—	0	
8	25	1	0	0	0	0
9	27	2	—	1	0	0
10	11	2	2			
11	55	9	8	4	1	
12	39	1	4			
13	15	1	3			
14	23	1	2	—	4	
15	51	6	11	10		
16	13	2	0	1	3	
17	45	3	3	3	5	1
18	73	6	15	8	7	

multiply outside of the host animal, but there is a possibility that the organism can retain its vitality in nature much longer than the mammalian tubercle bacilli and thus manage to survive in pastures and in feed-lots where tubercle bacilli would perish.

Of the varieties of tubercle bacilli, the avian possesses much greater ability to persist in the soil than the mammalian types. For instance Traum³ has shown that the tubercle bacilli in cow manure die off rapidly when the moisture content is lost. In one experiment he found no living bacilli after as short a time as 17 days. On the other hand, Schalk,⁴ working with the avian type, found viable bacilli in the soil of poultry-runs after they had been vacant two winters and one summer, a time interval of 20 months. This soil must have been very dry a portion of this time. These results substantiate the experiences of many that pastures on which tuberculous cattle have run become free of infection comparatively soon after the infected cattle are removed, while ground on which tuberculous birds have run harbors the infection for long periods after all birds are removed.

We have no direct data upon the viability of the bacillus of Johne's disease in soil. Since none of the smaller laboratory animals are susceptible to infection, such data are difficult to obtain. Besides other close similarities to the avian type tubercle bacillus, we have found that cultures of the bacillus of Johne's disease have surprising vitality. Whereas cultures of mammalian tubercle bacilli yield subcultures only with difficulty when they are more than two months old, avian bacilli and Johne's bacilli will yield subcultures easily from cultures that have not been transplanted for six months or even a year or longer. This leads us to think that the bacillus of Johne's disease, like that of avian tuberculosis, probably has the ability to persist for considerable periods in the soil of pastures. If this is the case, the testing of affected herds and the removal of reactors could not be expected to eliminate the infection from herds as quickly as in the case of bovine tuberculosis, even if the test were as reliable in detecting the infected animals as that for tuberculosis. In time, however, if the newly infected animals are removed before they reach the stage of becoming spreaders of infection, the infection should die out.

THE COMPLEMENT-FIXATION TEST

The complement-fixation test has been used by Twort⁵ and by Bang and Anderson⁶ for the diagnosis of Johne's disease. Twort did very few tests but Bang and Anderson carried out a com-

paratively large number. Both found that animals affected with Johne's disease frequently would react to the test. The latter found that 60 per cent of the animals which had reacted to avian tuberculin (injected subcutaneously) reacted to the serum test, and that all animals, which were so far advanced in the disease as to show symptoms, reacted. For their antigen they had best results when human tubercle bacilli were employed; the results with suspensions of the specific bacillus of the disease were not so successful. Animals affected with tuberculosis also reacted to the test; hence, to be of diagnostic value for Johne's disease, one has to be sure that tuberculosis does not exist in the herd. Bang and Anderson found that a small number of animals reacted to the test when there was no evidence that they were infected either with Johne's disease or tuberculosis, but since both of these diseases are very common in the cattle in Denmark at the time, they could not often be sure that these diseases were absent.

The technic of the complement-fixation test for acid-fast infections has been greatly improved since 1913, when the latest work had been done, hence we considered it worth while, when we began our work, to restudy the question. A variety of antigens have been tested. In the earlier part of the work we found a partially defatted tubercle bacillus antigen like that of Wilson⁷ to be most satisfactory and this antigen was used in all studies up until the last year. More recently we have employed the antigen of Witebsky, Klingenstein and Kuhn⁸ and have been using a quantitative technic which we believe to be greatly preferable to the single-tube test previously employed.

Complement-fixation tests have been conducted as a routine procedure on all animals in our experiment herd about once per month. The tests agree with the allergic tests in a large percentage of cases. In recently infected animals both tests become positive about the same time. In case the time for the semi-annual allergic test happens to fall within a month or two after animals have been artificially infected with Johne's disease, they sometimes will react allergically before antibodies detectable with the serological test have appeared. The test becomes positive in most cases long before symptoms have appeared, however, and remains positive until the death of the animal. We have found the most useful service of the test to indicate whether emaciated, scouring animals, ones which usually fail to react to the allergic tests, are affected with Johne's disease or with some other malady. For this purpose the test is probably the most reliable method available.

Many complement-fixation tests have been conducted on field herds in which Johne's disease existed and some in herds in which it did not exist. In some of these herds there have been many disagreements between the allergic and serologic tests. In general it may be said that the serologic test is frequently positive when the animal certainly is not affected with Johne's disease or tuberculosis, nor is there any apparent opportunity for sensitization of the animals with human or avian type tubercle bacilli. The test is not specific for Johne's disease, as has already been pointed out. In all probability any kind of acid-fast organism would suffice to sensitize animals so that they would react. Whether many animals are sensitized by contact with acid-fast bacilli, saprophytic or otherwise, or whether the sensitization is gained in other ways, we do not know. That a sensitization exists and that antibodies which react with the antigen are present has been proven in a few such cases by conducting absorption experiments. In some herds these sensitized animals are not found, in others a considerable part of the herd appears to be sensitized. In most large herds a few such are usually found.

These animals interfere with the accuracy of the test to such a degree that it is not advisable to employ it in diagnostic work except to confirm the allergic test. It is possible that further work on the chemistry of the antigens will make it possible to produce an antigen which is more specific than the ones which we now have, and that the serological tests may ultimately prove to be of greater value than any which we now have. Experience in our own herd indicates that the test, as it is now being conducted, will give positive results regularly with sera of animals which are still in the incubation period of the disease.

SUMMARY AND CONCLUSIONS

1. Data are given to support the conclusion that Johne's disease in cattle can be diagnosed with a reasonable degree of accuracy by the aid of avian tuberculin injected intravenously.
2. The dosage of the tuberculin must be carefully graded so as to induce sharp reactions in affected cattle and give none in normal cattle.
3. When the testing fluid has high potency, the temperature curves begin to develop in from three to five hours and reach their peaks in from five to eight hours after the injection. If the fluids are less potent, these times may be delayed. Delayed curves are obtained if potent products are injected subcutaneously or if the intravenous dose is too small. When using

potent products, temperature curves which begin after the eighth hour are ignored as having no diagnostic significance.

4. In our experiment herd, successive tests upon all animals have reflected an accurate picture of the spreading of the disease. Affected animals in most cases have continued to react on consecutive tests until the death of the animal or at least until the development of clinical signs of disease. A considerable number of animals fail to react when they are far advanced in the disease. Non-infected animals, with only occasional exceptions, have shown no tendency to react. These exceptions may be animals which are temporarily infected.

5. Tests have been carried out on a considerable number of herds in which the disease has been naturally prevalent. In many of these we have not been able to induce the owners to eliminate the reacting but normal-appearing animals. Data are given on eighteen herds in which reactors have been removed and slaughtered. These show that Johne's disease has apparently been eliminated from several by two or three semi-annual tests, but other herds have proven more stubborn and it does not look as if much progress had been made after three or four tests.

6. It is suggested that the persistence of infection on infected farms may be due to the unusual vitality of the Johne bacillus. This organism resembles the avian type tubercle bacillus in many ways, and like the avian bacillus appears able to remain alive on unfavorable media for long periods of time. If the organism can retain its vitality on infected pastures for considerable periods of time, this fact could explain the difficulty in ridding a herd of the disease.

7. The complement-fixation test can be utilized for the diagnosis of Johne's disease. Affected animals begin reacting before clinical evidence of disease appears, and continue to react as long as they live. A considerable number of animals, not suffering from Johne's disease or any other disease, as far as can be determined, react to this test. The cause of this sensitization is not known. Because of this fact, the test cannot be recommended as an accurate diagnostic procedure.

8. We have found complement-fixation useful as a confirming test, used with the allergic test. It is useful, especially in those animals which have developed clinical signs of the disease and do not react to the allergic test, for these animals practically always react serologically.

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DISCUSSION

DR. C. E. COTTON: I should like to ask Dr. Hagan about his experience with the period of incubation.

DR. HAGAN: Of course, when we infect animals artificially, we know when to begin counting. We have animals that have come down as early as five months after infection, at the earliest. We have others that have gone over three years, at the present time; we don't know how much longer they will go. From five months to three years is our experience in artificial infection.

In natural infections it is very difficult to say. In our own herd, counting from the time the calf appears in the herd, it has averaged more than two years, from two to over three years.

DR. WALTER WISNICKY: During the past year we have noted in our State that the disease continued to spread. To what degree, we cannot state definitely, but we are conscious of the fact that the disease is spreading.

As Dr. Hagan's paper indicates, control measures are not so effective as we would like to have them. I can cite one experience that we have had in a herd just recently. There were a few clinical cases that suggested that *Johne's disease* may have been present. We subjected the entire herd of 30 animals to test and 22 reacted. We decided to send the entire herd to slaughter, and every one of the 30 animals showed lesions of *Johne's disease*.

PRESIDENT MALCOLM: Is there any further discussion? If not, we will go on with the program.

The next paper is to be presented by Dr. L. Van Es, "The Three Types of Tubercle Bacilli in Live Stock Sanitary Control Work." (Applause)

. . . Dr. Van Es read his paper. . . .

THE THREE TYPES OF TUBERCLE BACILLI IN LIVE STOCK SANITARY CONTROL WORK

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Fifteen years have passed since the more or less desultory public and private efforts to cope with the waxing incidence of bovine tuberculosis began to be consolidated with the nation-wide system of eradication of which we now begin to witness the beneficial results. For a quarter of a century, avian tuberculosis has shown a mounting morbidity and during the greater part of

this space of time this was paralleled by an increase of avian bacillary infection in swine.

When we analyze the statistical data pertaining to the incidence of bovine tuberculosis, as revealed by progress reports bearing on eradication campaigns and by its morbidity rates disclosed by the federal meat-inspection service, it becomes clear that, in the course of the last fifteen years, the cattle tuberculosis situation in this country has substantially changed. As a concomitant result the incidence of the disease, as revealed by the number of outright condemnations of carcasses, also has become materially reduced. The vexatious foci of tuberculous infection, such as the pure-bred herds, have practically been removed and the tuberculous dairy herds, as a result of the campaign, and because of an aroused public sentiment, also have declined in numbers.

Whole states and large areas within other states have had their tuberculosis incidence reduced to a bearable minimum. For these territories the bovine and swine tuberculosis situation has been changed for the better, to be sure, but has not been removed for all time. The problem of achieving freedom from bacillary infection there has been replaced by the one of keeping free from it. This time may be the proper one to visualize the latter phase of the situation.

In connection with the latter, we must always keep in mind that in its essentials tuberculosis eradication can mean but one thing, namely, the destruction of the causative virus: the *Bacillus tuberculosis*. It seems doubtful that the latter will ever be consummated; we may do away largely with the disease in certain species or groups of animals, but as it is probably impossible to destroy the tuberculous virus *in toto*, some sort of a tuberculosis problem will remain to challenge the vigilance of the live stock sanitarian.

In as much as the elimination of the tuberculous animal is the major factor when striking at the etiologic parasite, it follows that the more completely the living source of infection be eliminated, the less costly, the less irksome will be the task of keeping the disease under future control. Stating this in another manner, the less undetected tuberculosis we leave behind in our campaign activities, the less will be the danger of recrudescence of tuberculosis in the future and the less costly will be the solution of tuberculosis problems in times to come.

A brief contemplation of some of the biologic phases of tuberculosis and especially of the tubercle bacillus may be helpful in

bringing clarity pertaining to actual and future problems connected with the disease and its control.

As we have come to know the tubercle bacillus, it is a strictly obligate parasite and for so far as our present-day knowledge goes it propagates itself only within the animal body. It constitutes a definite biologic entity and has secured for itself a place among other living things. Like other species of plants and animals, it is endowed with qualities by which, as a species, it is capable of maintaining itself in nature, even in the face of various adversities. Foremost among these qualities we must recognize the power of variation as one of the means by which living things become capable of adapting themselves to changes in an accustomed environment, in food and in other factors essential to continuous specific existence.

In this manner the tubercle bacillus has in the course of time formed more or less distinct varieties or types, each being associated with certain animal species as its optimum hosts. These types show distinct characteristics not only in their pathogenicity, but also in their mode of growth on artificial media. This most distinguishable character is shown by the host-parasite relations of which they may otherwise be capable.

Thus, we have come to recognize three principal varieties or types, which in accordance with their optimum hosts are designated as bovine, human and avian tubercle bacilli. The bovine bacillary strain is accountable for the preponderating number of cases of cattle tuberculosis, the human type is the cause of by far the greater number of human cases and the avian variety is almost the sole cause of the disease in barnyard poultry. These types can be recognized accurately by bacteriologic methods and can be differentiated rather sharply. However, as further evidence of the variability of the tubercle bacillus, mention should be made of the fact that occasionally bacillary forms are encountered which defy a clear-cut differentiation. These types may or may not be on the way toward a more or less specific host specialization, whereas the former may already have reached such an optimum adaptation.

The better known types, as it were, have specialized as the causes of tuberculosis in their optimum hosts, but they have done so without completely losing a certain capacity for finding a suitable soil in species other than the one of choice and there to cause the morbid changes to which we attach the name "tuberculosis." An abundance of evidence of this highly interesting phenomenon, on several occasions, and by various workers, has

been brought to the attention of this organization and hence will not require additional mention.

Some of the phenomena associated with heterologous bacillary infection, however, have a practical bearing on the general prophylaxis of tuberculosis and urge themselves upon the attention of persons particularly concerned with the subject.

Bovine bacillary infection, the cause of by far the greater number of cases of cattle tuberculosis and, hence, most commonly associated with the bovine species as the homologous host of this strain of bacillus, also has at its disposal a considerable number of subsidiary host species which, from the standpoint of prophylaxis, must be given consideration. Man, swine, horses, goats, sheep, dogs, cats, aside from a number of pet animals and captive wild species may, and more or less constantly do, supply the bovine bacillus with suitable host conditions for its propagation. Hence, all animals developing tuberculosis of bovine origin must be regarded as actual or potential factors tending to keep bovine tuberculosis alive in a given population and environment. These are reasons enough to assume that a heterologous host which acquired tuberculous infection from cattle may develop lesions, which render it capable of becoming a source of danger to the original host species.

The importance of the heterologous host species of bovine tuberculosis, however, must not be overestimated. They certainly are important enough for constant consideration, but their tendency to serve as incubators for the bovine bacillary strain is, no doubt, less of a source of mischief than the instances of homologous infection in bovine animals which may have escaped vigilance in the conduct of the campaign or which may be found in territories noted for their low incidence of tuberculous disease.

In connection with the latter it should be kept in mind that the cattle population in such regions is not always homogenous in character. It is true that the tuberculosis morbidity of such cattle as may be found on the open ranges, where they are maintained in a semi-wild state, may be exceedingly low, yet, frequently, in such regions there may be found farms and dairies where range conditions do not prevail, which, in their herd management, do not differ from those in areas where tuberculosis is common and where the practice of stabling is conducive to a higher morbidity rate.

Although the bovine species must remain to be looked upon as the chief source of bovine tuberculosis infection, the heterologous hosts of the latter must not be overlooked. There can be no doubt that open cases of bovine tuberculosis in such animals as swine,

goats, horses and others are certainly capable of becoming a definite hazard to cattle with which they happen to be in more or less close contact. Even man, also liable to bovine infection, on occasion, may constitute a potential distributor of this disease even if this danger may not at all be a formidable one. With a certain possibility in mind, attention is called to the fact already reported to this group, that of the nine cases of bovine bacillary infection encountered in a series of cases of human tuberculosis, six pertained to renal tuberculosis eliminating the bacilli in the urine. One may readily conceive that, under certain circumstances, such bacilli gaining access to cattle may become responsible for tuberculous disease in the latter. It is not to be thought that such a transmission is of common occurrence. The possibility is there and should be considered where an unexpected and unexplained tuberculosis in a given herd has to be traced to its origin.

Cases of tuberculosis in cattle occurring in herds where there was no reason to expect the disease, because of an absence of previous cases, or because of the proven contact with other cattle, should always be thoroughly challenged as to their origin. By doing so, further mischief may be prevented, while such attempts, in a measure, will help to place the crown of finality upon eradication efforts.

With regard to the possible part played by the human bacillary strain as an etiologic factor in the tuberculosis of animals, it seems that, with the exception of the monkey and parrot, the hazard is but a slight one. This probably is mostly the case because of a certain lack of opportunity for infective contacts, for continued exposures and, as far as cattle are concerned, because of the relatively marked resistance of bovine animals to infection by heterologous types of tubercle bacilli. However, it must not be overlooked that, in some experimental efforts to cause tuberculosis in calves by infecting them with human bacillary strains, positive results could be recorded.

Reports of definitely established spontaneous cases of human tuberculosis in cattle are exceedingly rare in literature. That they may occur, on the other hand, was more recently shown by Hibma.¹ This veterinarian reported a case of tuberculosis of the bronchial and mediastinal lymph-nodes of a cow which had previously shown positive reactions to the ophthalmic and subcutaneous tuberculin tests. This animal was born on a farm where a positively reacting animal had never been found before. This farm, furthermore, is situated on an isolated island where a systematic tuberculosis control is being maintained and where, during the previous four years, no positive reactions to

tuberculin had been encountered. Owing to these circumstances, the bacilli present in the lesions were subjected to a typing experiment by which it was possible to determine that the human bacillary strain was responsible for the lesions.

Swine, as a rule, are less resistant to the human bacillary variety than cattle and, on the whole, pigs are more susceptible to the bovine and avian types of the tubercle bacillus as far as this can be ascertained by evidence coming from the field. However, spontaneous infection of swine by human bacilli has occasionally been found and some years ago, at one of our meetings, Butler and Marsh² reported an interesting outbreak of tuberculosis in swine due to infection by bacilli of human origin which were conveyed by the feeding of raw garbage coming from a hospital in which tuberculous patients were being cared for. From the available evidence it appears that swine having infection opportunities in connection with human tuberculosis are apt to contract the disease.

The susceptibility of the goat to disease caused by human bacillary types in experiment animals equaled that of the ox, but reports of cases of spontaneous infection are not available in the literature open to the author. Sheep seem to be resistant to the human type of bacilli, but data obtained by experiment are quite scarce and those pertaining to spontaneous infection are still more so. Dogs, although somewhat resistant to all forms of tuberculosis, are equally susceptible to the bovine and human strains. Cats are generally considered not to be susceptible to human infection, but appear to be liable to contract tuberculosis of bovine origin. Of the four tuberculous monkeys of which the lesions were typed a few years ago by the Nebraska Experiment Station, one showed the disease to have been caused by a bacillus of human origin and from the other three bovine strains were recovered.

In the tuberculosis of farm poultry the disease is nearly always caused by the avian tubercle bacillus. Avian tuberculosis caused by mammalian bacillary types has been reported, but such cases must be so extremely rare that although the possibility must be recognized, it seems doubtful that human and bovine types of tubercle bacilli, so rarely found in avian tuberculosis lesions, constitute a material hazard to farm animals.

In an extensive series of fowls injected with either human or bovine tubercle bacilli, none of the subjects developed tuberculosis, with the exception that, in one or two birds, a small tubercle had developed in liver or spleen in which acid-fast bacilli could be demonstrated.³

Attention may be directed to the fact that certain observations⁴ tend to show that a considerable number of birds, into which tubercle bacilli of the mammalian types were introduced, either by inoculation or by injection, died after variable periods in a highly emaciated condition, and that such subjects, without presenting the classical lesions of tuberculosis, continued to harbor viable and virulent bacilli for extended periods. It seems thus possible that birds feeding on mammalian tuberculous material may serve as carriers and transmitters of mammalian tuberculosis. No evidence, however, has thus far been presented which may indicate that such actual transmissions have been found to occur in the field.

On the other hand, within the last fifteen years, it has been abundantly demonstrated that the avian tubercle bacillus, *per se*, has decided pathogenic qualities when taken in by a number of heterologous mammalian host species. On several occasions evidence has been presented before this body, as well as in the literature of veterinary medicine, that avian tuberculous infection plays a conspicuous part in the etiology of swine tuberculosis. In fact, it could be clearly shown⁵ that in this country, at least, the avian bacillary strain originating in tuberculous farm flocks could be held responsible for the marked increase in the retentions of swine in inspected abattoirs, experienced during the period 1907-1922.

Later it became evident also that the avian tubercle bacillus could initiate tuberculous lesions in cattle (Plum,⁶ Van Es and Martin,³ Van Heelsbergen,⁷ and many others).

European literature indicates the occasional finding of human tuberculosis caused by the avian bacillary strain, which has likewise been proved to be the etiologic factor in a small number of cases of bovine tuberculosis. It is by no means improbable that other mammalian species on occasions may be found to show lesions for which the avian tubercle bacillus is etiologically responsible.

It is apparent that practically all varieties of the *B. tuberculosis* have retained a more or less well developed capacity for heterologous host relations. Some of the latter are of live stock sanitary and public health importance, others may be only potentially so and another portion is as yet negligible aside from the mere academic interest they may arouse. It is probable that their importance will grow as time advances. As the optimum host relations of one of the bacillary types become interrupted by hygienic efforts, the likelihood for some other types to supplant it, if not also suppressed, is not altogether an imaginary one. New

adaptations may come about in as much as the tubercle bacillus, as we know it today, in all its varieties, is probably quite as plastic in regard to its ecologic relations as the original form from which they sprang.

As yet, the lesions encountered in most cases of heterologous tuberculosis are rather benign and non-progressive in character, but they may not always be so in the future. We have already seen generalized, progressive cases of avian tuberculosis of swine and in the course of the year the writer was permitted to see the lesions of a similar character in a sheep. These revealed a pathogenicity of the avian bacillus for this heterologous host, which could be compared with that toward a species in which a tubercle bacillus finds its optimum in conditions for development, dissemination and virulence.

The data pertaining to heterologous bacillary types as disturbing factors in the interpretation of tuberculin test results are, as yet, somewhat contradictory. Certain experiments² tend to deny such a disturbance. In these it was found that 75 per cent of the cattle exposed to avian tuberculous infection became sensitized to avian tuberculin, but not to the tuberculin prepared from mammalian bacilli. Yet, the fact that, of the eleven cases of avian infection of which the lesions were typed by the Nebraska Agricultural Experiment Station, six pertain to animals which were sent to slaughter because they had reacted positively to the regular mammalian tuberculin used in the campaign, cannot readily be dismissed without further thought.

Whatever the future may reveal, it seems certain that all problems connected with tuberculosis are closely related, perhaps more so than we have reason to believe at this time.

All tuberculosis, regardless of the bacillary types involved, have as their primary cause only one specific biologic form, the *Bacillus tuberculosis*, possessed of a remarkable genetic plasticity and of a conspicuous power of adaptation. This fact alone is an indication that in the general efforts of eradication, live stock sanitarians should remain apprehensive of what heterologous bacillary varieties may ultimately bring about.

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DISCUSSION

DR. WALTER WISNICKY: It is a privilege and a pleasure to be called upon to discuss a paper presented by such an eminent scientist as Dr. Van Es. I recognize that it is beyond my ability to discuss a paper so scholarly prepared, and one which gives indication of having a ripe experience back of it.

The paper under discussion is prolific with suggestions, and has the property of stimulating one to thinking along many phases of bovine tuberculosis control work.

Calmette, the eminent authority on tuberculosis, made a prophecy, scarcely a decade ago, which reads as follows: "The fight against bovine tuberculosis obviously can succeed only when it shall be possible to make general the use of the method of preventive vaccination." From what has been accomplished in the United States during the last ten years, it is evident that the prophecy of Calmette will not come true as far as this country is concerned.

The march of progress in the control of bovine tuberculosis in the United States is clearly and graphically presented by data and maps prepared by the federal Bureau of Animal Industry. This information indicates the extent of infection when the work began as compared to the present incidence of the disease. Large areas, where bovine tuberculosis has not obtained too firm a foothold, have been able to reduce the infection so that at the present time they are regarded as modified accredited areas. Other sections of the country, where tuberculosis was more extensive, have made marked inroads against the disease. It is possible to visualize the United States as a complete modified accredited area.

But, when that accomplishment is attained, will we be free from the hazards of bovine tuberculosis? This question was raised in my mind as a result of reading Dr. Van Es' paper.

Only a small portion of the American public is sufficiently and intelligently informed on the tuberculosis eradication efforts to have an adequate realization of the import of the project. Now that we are on the road to success the public hears, on frequent occasions, of the victory being gained, and I am somewhat fearful that an impression that the task of bovine tuberculosis eradication is almost achieved is becoming widespread.

Ordinarily, in the course of human progress, we advance from the simple to the complex. Our initial efforts in bovine tuberculosis control may have produced a feeling that it was not difficult to cope with this disease. When infection was abundant, it was readily disclosed, and a high percentage of the animals showed lesions upon autopsy. As the infection is being reduced, new, complex problems arise, and we can easily come to the realization that we are going from the simple to the complex.

When an area is designated as a modified accredited area, the problem is not at an end. True, the disease is reduced to a low level, where it ceases to operate as a material economic hazard, but there is still sufficient disease left to continue the project as a problem.

At this stage we are confronted also with questions regarding complete eradication. The realization of complete eradication would mean complete destruction of all varieties of tubercle bacilli. This would mean, as Dr. Van Es has indicated, not only the complete eradication of the bovine strain of this organism, but also the complete elimination of all related strains.

In translating the wise counsel of the paper under discussion, for the purpose of concrete and practical application, I am led to give suggestions under two headings: first, to use all available knowledge and proven practices in continuing our principal effort to reduce

the bovine infection; second, to keep in mind a sustained regard for the related strains of tubercle bacilli, remembering the relationship of these organisms and realizing that one cannot be eliminated completely from an area without giving consideration to the others.

There are several points under the first heading which may bear discussion briefly. The application and interpretation of the tuberculin test is not a dead subject. It still bears prolific opportunity for improvement.

Herds which have a history of infection, those which are suspected of harboring the infection, or badly infected localities, for best results, can be tested by the double intradermic method or, in special cases, by a combination of two or more of the tests. The little experience that we have had with the double intradermic method indicates that using the additional injection supplies a valuable aid in the detection of infected animals.

With the progress of this work and the accumulation of authentic disease histories of the various herds, it is possible to use these histories when combined with other information available from the herd-owner, at times, to reach proper decisions when there is some question as to whether an animal is a reactor or not. Herd history, in arriving at a diagnosis, may serve as a valuable aid, but it is, in some respects, like a double-edged sword, and must be used with grave caution.

In studying the histories of herds that had a heavy infection at the outset, it was disclosed that in many of these herds, animals continued to react until almost all of the original herd was sent for slaughter. These studies further indicate that the infection was carried over in some of the animals which did not react. In Wisconsin, we are inclined toward the policy of condemning an entire herd, when the majority of the animals react. Such procedure may be desirable where the incidence of infection is low, and may not be regarded in the same light in areas where the infection is still high. Proper safeguards would have to be put up so that those unscrupulously inclined could not take advantage of the situation for the purpose of realizing a pecuniary gain.

In the past, the common practice has been to continue retesting infected herds at intervals, until such herds have given one clean test. A survey of our records indicates that one clean herd test is not a sufficient warranty to discontinue the frequent retesting of such herds. It would appear that infected herds should receive at least two clean tests at intervals of from 60 days to 6 months before they are permitted to go a longer period without testing.

Although the bulk of active infection exists in diseased animals, there is sufficient danger in infected premises so that they warrant a larger measure of consideration. Usually the barn and equipment are given a thorough cleaning and disinfection. The yards and premises, which may harbor the etiologic organisms, are not regarded as of sufficiently great importance. There is some indication that water-holes or watering-places out in the pasture in low-lying ground harbor the organism and create a hazard. In the clean-up of barns and premises, not only should thorough cleaning and disinfection apply to the barns, but the yards and pastures should be given full consideration and every potential hazard removed.

There is a tendency to cease effective pasteurization of dairy products which are returned to the farm from creameries and factories, particularly in localities where the incidence of infection is now low. The practical mind of the farmer and the dairy products manufacturer cannot grasp the need for pasteurization, when the incidence of bovine tuberculosis is at such a low level. Due to these circum-

stances a prolific opportunity exists for the widespread dissemination of tuberculosis. An experience with at least one concrete case may be related where an infected, undetected animal was responsible for infecting a large number of cattle in one locality, through the creamery route. The infection was not detected until an area retest was made. On this area retest, almost all of the patrons receiving milk by-products from the factory were found to have herds harboring the infection. This was a clear-cut case and demonstrates the possibility of spreading the disease. The county in which this incident occurred happened to be one with a very low incidence of infection. If the reaccreditation of this county had been accomplished by testing 20 per cent of the cattle, and had this locality not been chosen to be tested, a reaccreditation could have been received when a considerable number of cattle were infected. A complete area retest in this county was the means for detecting this spreading infection.

In herds where infection continues to persist, and reactors are taken out every time a test is made, every effort should be made to determine the source of the infection. Other classes of domestic animals may be thoroughly examined and tested if necessary. If it is decided that other domestic animals are not the source of the infection, and every precaution was taken to eliminate premise infection, it may even be advisable to question whether the source of the disease may not be originating from a human being. If no progress is made in the uncovering of the source of the infection, it is well to return and place the bovine species under further scrutiny.

In the mention of the second heading it may be stated that there is already a realization, in some sections of the country, that the avian strain of the disease must receive consideration in order to prevent the continuance of the large economic losses which it produces. A number of the North Central States, where avian tuberculosis is rather prevalent, have undertaken a program directed against this enemy within the past year or two. The work is new and sufficient progress has not yet been made to be reported. However, the indications are that definite accomplishments can be obtained if the effort will remain sustained and sufficient. The elimination of tuberculosis from poultry will automatically take care of this disease as far as swine and other farm animals are concerned.

Then, there still remains the tubercle bacillus of the human family. Live stock sanitarians perhaps will have only a limited opportunity to influence the reduction of human tuberculosis in a direct manner, but indirectly their influence may bear desirable fruit. There is a relationship between the program in reducing the bovine tuberculosis incidence and the existence of the bovine variety in other animals, as well as the incidence of the avian and human strains. There may be times and occasions when the flow of tuberculosis is returning to the species which has been given consideration and protection. In order to safeguard against this return flow, the human family, other species of animals and strains of tuberculosis organisms must be kept in mind continually.

In concluding, it may be stated that the complete eradication of bovine tuberculosis is a great distance from realization. We can continue to place the disease under more and more definite control and gradually work toward the objective of suppressing all strains of tubercle bacilli. The nature and scope of the problem is so great that we will have to leave the total annihilation of these disease-producing organisms to generations yet unborn.

Dr. C. H. HAYS: There is accumulated in the proceedings of this Association, covering the past several years, a large fund of knowledge regarding the disease tuberculosis, especially as pertains to its

involvement as a live stock sanitary problem; and which, it seems, should cover every possible detail of the subject. Yet, today we are permitted, in the paper that has been presented by Dr. Van Es, to note certain values and emphasis placed by him that will have peculiar interest and a useful purpose in the eradication program with which we are engaged.

We are greatly indebted to Dr. Van Es, and to several others as well, who have attained recognition through their research and studies as authorities on questions relating to tuberculosis, for their advice and counsel to guide us with this problem as live stock sanitarians. Your committee, as each succeeding committee having to do with the program regarding tuberculosis, has been confronted with an increasingly difficult task in providing for this occasion. In this instance they have wisely foreseen some of our immediate difficulties in the campaign against tuberculosis and have provided this sound counsel for our guidance.

Dr. Van Es referred to the progress made in the eradication of animal tuberculosis. In a number of states the work has progressed to the point where the question of type of infection must become of special concern in dealing with the continued occurrence or recurrence of the disease. In such situations, a knowledge, whereby the potential possibilities of the different types of infection as disease factors may be reckoned, seems essential. The benefits, to be derived thus, come in defense, as may be required, of work that has been completed; or, on the other hand, guide the offense to be made against the specific type of infection that may be causing the occurrence of the disease. The value of such knowledge as a weapon of offense perhaps may be more essential where advance and progress have been made in the eradication of the disease, but in our experience we have found that such knowledge has a particular value even in the commencement work.

The eradication of animal tuberculosis in South Dakota has not been so greatly extended and intensified as in a number of the other states. We are engaged largely with individual herd owners under the accredited-herd plan, and only in a limited way under the area plan. Since early in May, 1932, to date, reports of tuberculosis found in shipments of swine to a certain packing-house, operating under federal inspection, have been brought to our attention. These reports are being followed up by field investigations directed to the premises of origin of the shipment. Our primary object, in this instance, is to locate foci of bovine tuberculosis.

It has been possible, by reason of the knowledge possessed of type infection, that these reports coming to our attention can be limited to those cases where bovine infection has been most probably the cause of the disease. But after hearing Dr. Van Es, we cannot be so certain, for he has informed us that there may be generalized tuberculosis of swine from the avian type. However, this as yet perhaps occurs only in occasional cases and therefore we can be guided for all practical purposes by making our division on the basis of the extent of tuberculosis in the carcasses, indicating the bovine or the avian, whether a greater or lesser involvement, as the case may indicate.

Thus far such investigations have led us to centers of infection among cattle in our range country as well as to premises where general or mixed farming operations are under way. At the same time we have had reports of cattle infection found on the market in lots of animals having origin in our State. We have been tracing these and, with a practical certainty, can give our attention to the fact in such instance that the disease in cattle has been as a result

of contact with bovine infection from other tuberculous cattle. Within the past month, one such investigation has directed our attention to tuberculosis in one of our largest range operations. A number of the other similar investigations have revealed the disease in more or less isolated places where otherwise, for the time, the disease would have remained hidden.

The past year has seen efforts in various states directed in a very extensive, as well as intensive, way against the avian type of infection. We would be unable at this time to approach this disease problem of poultry so successfully except for the knowledge regarding the different types of tuberculosis infection. We can very reasonably explain to those to whom our service is extended the differences between the types and the possible occurrence of the disease among various species of live stock. The difference in the behavior between bovine infection and avian infection is a satisfying knowledge for explanation to the flock-owner in our cooperative avian tuberculosis program.

While the exact determination of a given type of infection of tuberculosis requires laboratory procedures, the possibility of its presence has been pretty well charted, at least sufficiently so to serve as a guide. These matters which have been so clearly explained by Dr. Van Es should be the common knowledge of each veterinarian engaged in field activities in the eradication of animal tuberculosis. Those who have had to do with this program of live stock sanitation can well appreciate the great value had from men contacting with the field cases who are fully and correctly informed in all such particulars regarding the disease.

In our work on tuberculosis eradication we are much impressed with the concluding remarks made by Dr. Van Es when he says: "All tuberculoses, regardless of the bacillary type involved, have as their primary cause only one specific biologic form, the *Bacillus tuberculosis*." The problem in the eradication of tuberculosis seems at times to become more complex as the studies of the disease are extended, but in reality are we not gaining headway and making out of this problem one less insurmountable? We must continue to seek and to assimilate the teachings such as were propounded here today; and to adopt the truths that are contained therein to guide our efforts if we are to attain the desired success in this enterprise.

DR. W. J. BUTLER: As most of the members know, one of the veterans has passed away. The dean of the state veterinarians is now riding the starry trail across the Great Divide. This is the hour of his funeral. I present the following resolution:

WHEREAS, It has pleased the Almighty to remove from our midst Doctor W. F. Crewe, one of our most worthy and respected members, and

WHEREAS, Doctor Crewe was actively affiliated with this Association for twenty-five years, and

WHEREAS, Doctor Crewe has held many responsible offices, including the presidency of this Association, and

WHEREAS, Doctor Crewe has served with distinction as State Veterinarian of North Dakota continually during the past twenty-five years, and

WHEREAS, In his capacity as live stock regulatory officer he has administered his official duties in a manner commanding utmost confidence and respect, and

WHEREAS, Doctor Crewe exemplified socially and professionally the finest things in life, now therefore be it

Resolved, That this Association express to the bereaved family our most sincere sympathy over the passing from our midst of one of God's finest characters and noblest of men, and be it further

Resolved, That a copy of this resolution be spread upon the minutes of the Association and a copy forwarded to the bereaved family.

DR. BUTLER: Mr. President, I move the adoption of this resolution by a rising vote, and I move, as a further token of our respect to the memory of Dr. Crewe, that we delay our deliberations and stand with bowed heads in silent prayer for one minute.

The audience arose and stood in silent tribute to the memory of Dr. Crewe.

PRESIDENT MALCOLM: The next paper is "Progress of Coöperative Tuberculosis Eradication Work," by Dr. A. E. Wight, Chief of the Tuberculosis Eradication Division, Bureau of Animal Industry, United States Department of Agriculture, Washington, D. C. (Applause)

Dr. Wight read his paper.

PROGRESS OF COOPERATIVE TUBERCULOSIS ERADICATION WORK

By A. E. WIGHT, *Washington, D. C.*

*Chief, Tuberculosis Eradication Division, Bureau of Animal
Industry, U. S. Department of Agriculture*

It is, indeed, a very great pleasure and honor to be privileged at this time to present the customary annual report on the progress made in the control and eradication of animal tuberculosis in the United States. It was exactly 15 years ago that this Association prepared and adopted a plan covering the methods and rules for the establishment and maintenance of tuberculosis-free accredited herds of cattle, which was later adopted by all of the state live stock sanitary officials and the federal Bureau of Animal Industry. I am sure that we all agree that the action taken by this Association on that occasion has proved to be one of the most important and outstanding features of this undertaking. The modified-accredited-area plan also was in the minds of some of the leaders of this campaign at that time, but was not adopted until a few years later.

During all the years that followed, many features of importance have occurred in connection with this work, but one of the most significant statements that can be made is that very substantial gains have been made in placing counties and entire states in the modified accredited area and, also, that during this period approximately 106,254,598 tuberculin tests have been applied to cattle, resulting in the removal of 2,514,875 reactors.

STATE AND FEDERAL FUNDS AND LEGISLATION

Federal and state funds available for tuberculosis-eradication work among live stock, naturally, have been reduced during the last year but, fortunately, it has been possible to continue the work without any serious interruption in most all parts of the country.

During the next few months the legislatures of practically all states will be in session and, again, the question of necessary funds to conduct the control and eradication of contagious diseases of live stock will be one to be given consideration. In some of the states, as far as tuberculosis is concerned, it will be possible to proceed with smaller appropriations than formerly, but, in some of the more heavily infected states, large appropriations will be necessary for a few years to come if there is to be no interruption in the progress of the work.

It is frequently necessary to amend the state laws providing for the control and eradication of tuberculosis as the work develops, and it is hoped that this matter will be given careful consideration. I have in mind, especially, the importance of providing, in some of the states, where all or nearly all of the counties are in the modified accredited area, that the counties be relieved of all expense in connection with this work, and that same be taken care of by the states. Where this practice has been followed the results have been very satisfactory, and there has been a general saving of public funds.

PREVALENCE OF BOVINE TUBERCULOSIS

During the early part of this year, the sixth biennial survey to ascertain the approximate extent to which tuberculosis existed among the cattle population was made by the state and federal authorities in charge of this work in each state. The results of this survey very clearly indicate that the incidence of this disease has been reduced since the survey conducted two years ago.

It will be recalled that the first survey of this nature was made in 1922, when it was estimated that 4.0 per cent of all the cattle in the United States were affected with tuberculosis. Surveys of this kind at two-year intervals thereafter showed a gradual reduction in the percentage of tuberculosis among cattle, and the survey completed this year indicates that the degree of infection has been reduced to approximately 1.4 per cent.

Of the 3,072 counties in the United States, tuberculosis among cattle to a degree exceeding 7.0 per cent was found in only 93 counties, while in about 2,840 counties the disease did not exist

to more than 1.0 per cent. Many of the counties in this latter group are in what is known as the modified accredited area. It has been the policy to give as much publicity as possible to this feature of the work in order that the public may become familiar with the progress that has been made and the amount of work remaining to be done.

ACCREDITED-HERD WORK

The records of the Bureau indicate that on November 1, 1932, there were 181,068 accredited herds, containing 2,967,976 cattle, which is some increase in the corresponding numbers of a year ago. In some states this feature of the work continues to be of more importance than in others, depending upon the conditions under which the coöperative work is conducted. In the state of New York, where there are more fully accredited herds than in any other state, the annual retesting of such fully accredited herds is done by local practicing accredited veterinarians at state expense.

AREA WORK

Within the last year, 231 counties have been added to the list of those that are modified accredited areas, in which the degree of bovine tuberculosis has been found to exist to not more than one-half of one per cent upon the application of the tuberculin test. In addition to these 231 counties, 36 towns in the state of Vermont also were placed in that status.

Under the provisions of the uniform plan for maintaining modified accredited areas, it is necessary to retest either a portion or all of the cattle within such areas, depending upon the degree of infection found on the original test. In this connection, during the last 12 months, 4,836,792 cattle, located in 367 counties due for remodification, were tuberculin-tested. Of that number of cattle, 14,387 reactors (approximately 0.3 per cent) were removed. It is gratifying to report that as a result of these retests all these counties were remodified in accordance with the provisions of the uniform plan. While this record is one that can be viewed with satisfaction, it shows that the infection of tuberculosis will reappear in modified accredited areas, and indicates the necessity of applying the necessary number of retests at the proper time.

On November 1, 1932, 1,502 counties, located in 42 states, were qualified as modified accredited areas, together with 65 towns in the state of Vermont. This is almost 50 per cent of the total number of counties in the United States. In addition, area work is now in progress in 316 additional counties. Modified accred-

ited areas are now to be found in all but six of the states, two of these being in the East, one in the South, and three in the West.

Just recently one of the formerly more heavily infected counties in the state of Connecticut was added to the list of modified accredited areas, signifying the possibility of reducing the degree of infection to the requirements of the modified-accredited-area plan in counties where bovine tuberculosis had been a serious menace.

Good progress in tuberculosis-eradication work under the area plan has been made in practically all sections of the United States during the past year. On January 1, 1932, all the counties in the states of Ohio and Wisconsin were declared modified accredited areas, and such action was taken in regard to all the counties in the states of Idaho, on June 1, and North Dakota, on July 1, 1932. These four states, together with North Carolina, Maine, Michigan and Indiana, make a total of eight states in which all the counties have been declared modified accredited areas. There are many other examples of especial interest that can be mentioned, including the excellent work done in the state of New Hampshire, where the task of completing the first test on all herds in the state was accomplished, with few exceptions, on June 1, 1932.

The modification of counties under the provisions of Section 27 of the Uniform Modified Accredited Area Plan, which was adopted by this Association in December, 1930, has continued, with the result that there are now 91 counties, located in 11 western states, which have been declared modified accredited areas under the provisions of this section. This work is being conducted in 15 additional counties in the western states in a very satisfactory manner.

The cattle-owners and the live stock sanitary officials of many of the southern states have shown much interest in area tuberculosis-eradication work during the last year, and many counties in those states have been placed in the modified accredited area as a result of one tuberculin test of all the cattle located therein.

CATTLE TUBERCULIN-TESTED FOR INTERSTATE SHIPMENT

Most of the tuberculin-testing of dairy and breeding cattle for interstate movement is performed by approved and accredited veterinarians. During the fiscal year ended June 30, 1932, approximately 227,000 such cattle were tested, in order that they might be shipped interstate. In addition to this number, about 40,000 dairy and breeding cattle were moved interstate after

having passed a tuberculin test applied by a regularly employed state or Bureau veterinarian. There has been some decrease in the number of cattle of this class moved interstate during the last few years on account of the lessening demand for replacements.

JOHNE'S DISEASE (PARATUBERCULOSIS)

During the last year, Johne's disease (paratuberculosis of live stock) has been reported from 11 states, and, altogether, 268 cattle were condemned on account of being affected with it. This number is approximately 9.0 per cent of the total number tested. This subject is to be given further attention on this program today, and the discussion, no doubt, will prove of much value to those who are cooperating with the owners of live stock in attempting to reduce the infection of this disease.

APPRAISAL, SALVAGE, AND INDEMNITY

The average amount of salvage obtained for cattle that react to the tuberculin test continues to be very low, as a result of the generally reduced prices paid for cattle of all descriptions. In September, 1932, the average salvage received for cattle condemned on account of being affected with tuberculosis was approximately \$11.00, as compared with about \$46.50 per head in 1929, or a reduction of over 75 per cent. The average valuation placed on condemned cattle in September, 1932, was \$64.45, which is about one-half of the average appraisal in September, 1929. The average amount of indemnity paid to the owners of tuberculous cattle by the state and federal governments during September, 1932, was about \$45.00, as compared to \$74.00 three years ago.

AVIAN TUBERCULOSIS IN SWINE AND POULTRY

Officials of the federal Bureau of Animal Industry have cooperated with the live stock sanitary officials in those states where avian tuberculosis is known to exist to a considerable extent. By this cooperation it has been possible to interest a large number of flock-owners in the project, as well as many agencies interested in the proper handling of poultry and swine. Those who have been identified with the cooperative campaign report that good progress is being made in combating this disease through the various methods that have been followed. Avian tuberculosis continues to be very prevalent in the central and north central states, where most of the efforts to control and eradicate it are now in operation. With the limited force that can be provided under present conditions, progress necessarily

will be rather slow, but it is hoped that within a few years the force can be increased so that a much more rapid elimination of the disease will be possible.

Records of the Meat Inspection Division of the Bureau of Animal Industry show a gradual reduction in the percentage of tuberculosis found among cattle and hogs. About 11.4 per cent of all hogs slaughtered under federal meat inspection showed some evidence of being affected with tuberculosis during the fiscal year 1932. Of this number, however, amounting to 5,222,420, only 83,260 were affected with tuberculosis to an extent whereby it was necessary either to condemn the carcass as entirely unfit for food or pass it for cooking under federal regulations. It will be recalled that in 1922, 10 years ago, the average retention of hogs on account of being affected with tuberculosis was 14.3 per cent, and that it was necessary to condemn as unfit for food or pass for cooking about twice the present number.

Of about 8,000,000 cattle slaughtered under federal inspection during the fiscal year 1932, exclusive of known reactors to the tuberculin test, tuberculosis was found in 38,446 (0.49 per cent), and of this number only 9,307 were found to be advanced cases of the disease. This is a very substantial reduction in the amount of infection of tuberculosis, as compared to that which existed ten years ago.

TRACING THE ORIGIN OF TUBERCULOUS ANIMALS

This Association, at its meeting last year, passed a recommendation submitted by the Committee on Tuberculosis suggesting that the United States Bureau of Animal Industry further extend its system of identifying tuberculous cattle and hogs found upon postmortem examination by Bureau veterinarians, and, also, that the state live stock sanitary authorities increase their efforts to locate premises infected with this disease by tracing the tuberculous cattle and hogs, as far as possible, when reported as a result of postmortem examination. These recommendations have been given due notice, with the result that there has been more activity in this connection during the past year than heretofore. As the amount of tuberculosis found among cattle at slaughtering centers decreases, it will be much more practicable to trace the origin of the infection. In some of the states a plan has already been devised whereby a very comprehensive record is kept of tags used in identifying cattle that have passed the tuberculin test, which will be very helpful in this connection.

An interesting case showing the value of obtaining records of

the origin of cattle found to be affected with tuberculosis upon postmortem examinations at the packing centers occurred during the past year. In April, 1932, 25 finished beef steers were slaughtered at one of the packing centers where federal meat inspection was maintained, and out of that number 23 were found to be affected with tuberculosis, 5 of which were advanced cases of the disease. The feeder of these cattle, naturally, was very much surprised to know that the animals were diseased, and as soon as he was notified he informed a representative of the Bureau as to where he purchased them before placing them in his feed-lot. He then had no cattle remaining on his premises. This information made it possible for a representative of the state to interview the party who raised the cattle.

It was found that the cattle in question were raised under range conditions in one of the western states, and that a few more than 100 cattle remained on the ranch. The ranch-owner, after a time, agreed to have a tuberculin test applied to his herd, which was located in a county where no regular coöperative tuberculosis eradication work was being conducted under the area plan. As a result of a tuberculin test applied to this herd in September, 1932, 58 out of a total of 111 head were found to be reactors. A postmortem examination of these reactors disclosed that 24 of the 58 animals were advanced cases of tuberculosis. It may be stated that a retest will be applied to this herd later.

IMPROVEMENTS IN THE WORK

It is fortunate that those engaged in the actual field activities connected with the eradication of animal tuberculosis continue to receive helpful advice from the research workers in the various laboratories where scientific studies of many features of the work are made. During the past few years there has been a gradual increase in the production of what is known as "Special F" tuberculin, prepared by the federal Bureau, a product found to be highly satisfactory.

For many years it has been customary to use saponified cresol solution as a disinfectant for premises infected with tuberculosis, but as the odor of this product is objectionable, especially in dairy barns, the Biochemic Division of the Bureau conducted many experiments for the purpose of discovering a more suitable disinfectant that would be practical and desirable to use. Such a product was finally discovered and is known as sodium orthophenylphenate, a grayish powder, readily soluble in water, of faint odor, and not severely poisonous. It is used in a one per

cent solution, but must be applied at a temperature of 60° F. or over.

CONCLUSION

The report I have just given to this appreciative audience, covering some of the phases connected with the elimination of animal tuberculosis, necessarily contains some statistics, but, in order that you may have a more complete statistical report of other important features of the campaign, a pamphlet has been prepared by the Bureau of Animal Industry of the United States Department of Agriculture, which will be available at this meeting. If additional copies are desired by any one especially interested in the subject, they will be furnished later, upon request.

DISCUSSION

DR. C. H. CLARK: It has been a great pleasure to listen to Dr. Wight's splendid report. The information relative to tracing the origin of cattle found to be affected with tuberculosis upon postmortem examination at the packing centers is of especial interest.

Wonderful progress has been made in tuberculosis eradication in this country in a relatively short space of time. When this work was started I doubt if the most optimistic individual engaged in the program could visualize the measure of success that has been realized in so short a time. However, we should not let our enthusiasm obscure our vision, and lose sight of the fact that a certain percentage of the disease still remains, even in modified accredited areas.

We do not favor delaying the test for reaccreditation of any accredited area more than three or possibly four years, if provision can be made for financing the testing program. Exception might be taken to this plan where, in fairly large areas, the disease had been practically wiped out.

Only three or four counties in Michigan have been accredited on a 20 per cent retest and, during the last few years, complete county tests have been conducted for reaccreditation. This method proves more satisfactory to all the interested parties. As taxpayers, the cattle-owners claim equal consideration should be shown them.

The plan adopted by your Association fifteen years ago for the control of bovine tuberculosis has withstood the test of time and it has been demonstrated that the plan is fundamentally sound. This assertion can be made honestly, I think, without fear of contradiction, whether the program is viewed from either a public-health or economic standpoint.

Tuberculosis-control activities in the various states have cost a large amount of effort and money, but we think it has been a sound investment in stock (not in stocks) and we are sure it can be demonstrated that the investment has returned excellent dividends.

A large measure of credit is due the federal Bureau of Animal Industry and the cooperating live stock sanitary officials of the various states for the excellent results that have been obtained, but we must not forget the coöperation and assistance rendered by the live stock interests of the country. Without their coöperation the program would have failed.

Dr. Wight has referred briefly to certain reductions in funds available to carry on the eradication program. Owing to existing condi-

tions which, I assume, it is unnecessary to name, retrenchment in local, state and federal appropriations have been necessary. In this connection, we will all agree that economy must be practiced, but if at any time state and federal appropriations for this activity should be so drastically reduced as to jeopardize the program, we doubt if true economy would result.

I am not entirely familiar with the methods of administration of the control work in the various states. However, Dr. Wight has mentioned the necessity of occasionally amending state laws providing for tuberculosis control. This was done recently in Michigan and marked savings have resulted and without impairment of efficiency.

In the beginning of the program in Michigan, the state laws were amended to provide that the respective counties, which were designated as units for accreditation, could, through action of the Board of Supervisors, appropriate money to cover operating expenses. The State, however, provided funds for the payment of indemnities. This method was in force until ten months following the complete accreditation of the State and until June 30, 1931. The 1931 Legislature enacted a law providing that the State should provide the funds for operating expenses, thereby relieving the counties of the necessity of making any appropriations to carry on the work. This law was made effective as of July 1, 1931. Prior to July 1, 1931, the average cost of testing was 30 cents per head. During the fiscal year beginning July 1, 1931, 705,000 cattle were tested at a cost of less than 19 cents per head, showing a saving of approximately \$78,000 for the year, as compared with previous years. Practically all of the work is done by local accredited veterinarians, where such services are available, and the work is supervised directly from Lansing. In Michigan the expense of testing for the reaccreditation of individual herds is assumed by the owner.

The following data might be of interest to live stock sanitary officials when considering the application of the rule which provides that areas, in which a complete area retest of all the cattle in said areas indicates a degree of infection not exceeding two-tenths of 1 per cent, may remain in the modified accredited status for a period of six years from date of remodification.

Forty-seven counties in Michigan have been reaccredited the second time; 29 have been reaccredited for the third time and one for the fourth time. During the last 16 months, 43 counties have been reaccredited. In 8 of these 43 counties, no reactors were located. There were 95,819 herds tested, containing 847,660 cattle. Extensive infection was found in 67 herds, containing 348 reactors and located in 20 of the 43 counties. Fifty-nine of the 67 herds showed no history of previous infection. Extensive lesions or tankers were found among the reactors from 35 herds. In 11 of the 20 counties two-tenths of 1 per cent, or less, reactors were found.

Sufficient data and information have been obtained to show the necessity of the need of a definite program to assist the poultrymen and farmers in eradicating tuberculosis from their flocks and swine herds. We trust that such a program can be planned and carried out. In our State quite complete surveys have been made by field inspectors engaged in tuberculin-testing and a certain amount of work is being done in areas where flocks are found to be heavily infected, but at the present time the force we have available cannot give this activity the attention it deserves.

In relation to Johne's disease, it is known to exist in a few herds in the State, but there is no evidence that it is widely distributed. In one of these herds, the disease has caused quite serious losses during the last three or four years.

MR. C. L. JOHNSON: If you will look at the program you will observe that nearly all participants on this program have the title of "Doctor." I just simply want to have it understood that I do not speak as a scientist nor as a practitioner, but only as a regulatory official and a Connecticut farmer.

For the past four years it has been my privilege to attend this conference, and I have gained a keen realization of the importance that this conference bears to the welfare and the interests of the live stock industry. One cannot help be impressed with the sincerity of those who come here to present and discuss the subjects that appear on the program.

It emphasizes the fact that science is the soul of the prosperity of our nation and the living source of all human progress. It also brings to us very forcefully that science is constantly searching for new light and more knowledge, and how often doesn't it happen that it takes years of study, years of toil and sacrifice and the expenditure of large sums of money in order to create one single spark of new life? But this spark is the key, the seed to progress, and once it has been created, the stepping stone is soon laid, and civilization moves forward.

The progress that has been made in the last quarter of a century in combating, eradicating and preventing diseases, both human and animal, is sufficient evidence that no disease is beyond the ken of man. Disease is no longer a fiat of fate that must be accepted submissively and blindly. It also demonstrates the mighty power that is possessed in the human brain.

When we consider that for centuries no disease has caused greater human suffering and human grief than tuberculosis, and when we consider the untold millions of dollars' worth of animal value lost on account of this disease, and then we listen to Dr. Wight's report of progress, and we review the record of progress in eradicating and preventing this disease for the past ten years, we find an outstanding achievement in human history.

Let us turn to New England for a moment, the part of our country which the historian refers to as "The Cradle of American Liberty," "The Land of the Pilgrims," and the home of such men as Emerson, Longfellow, Channing, and so on. Then we turn, if you please, to the map published by the United States Bureau of Animal Industry for the purpose of showing the extent of infection in different parts of the country, indicating thereon, in colors, the various degrees of infection in various sections. By observing the map which you have before you, you will observe that back in 1922, Connecticut and parts of New England were painted pretty black. From this it can be implied that Connecticut is not only the cradle of American liberty but also the cradle of bovine tuberculosis and the home of the tubercle bacillus, the little devil that is sometimes called T-B for short.

Every sanitary official in the eastern states can testify to the truth of this statement, with possibly one exception, and that is the great old state of Maine, the Pine Tree State. I have heard it remarked that if we had more pine trees in our country we perhaps would have less tuberculosis. One of the greatest problems in our social life, in our commercial life, has been the unequal distribution of all commodities, unequal distribution of gold, and we also have unequal distribution of disease. There we have, as I told you, the great state of Maine with only two per cent, and the little state of Rhode Island that never did anybody any harm has to battle with fifty per cent. Human nature is no different in Connecticut that it is in Minnesota, California or Illinois.

The greatest problem that faces a coöperative movement in relation

to agriculture has been selfishness and independence and lack of vision on the part of the individual. There is only one weapon against an obstacle of that nature and that is education, although there are some states that have found it necessary to resort to the militia. (Laughter)

Let us review the part that the sanitary official and the veterinarian takes in this great campaign against tuberculosis. In the first place, the regulatory official belongs to the floating element. Nevertheless, my observation has been that, regardless of whether his term is a long one or a short one, he strives to have the good will of the people that he serves. He wants to be well thought of, and he wants to accomplish results. I feel that as long as that thought is uppermost in the minds of our public officials today, democracy is safe for some time to come.

In regard to the regulatory official and the veterinarian, of course they must travel hand in hand. The regulatory official cannot do anything unless he has the support of the veterinarians in his state, and it is part of his business to see that he has, or else he is not going to get very far.

To begin with, in this campaign to eradicate tuberculosis, the first thing he had to do was to set up the machinery for the practical application, or the means provided by science, in order to detect disease and accomplish results. That was no small job.

Secondly, he had to acquaint, he had to educate, and he had to convince the cattle-owner of the purposes of the plan, its advantages, and the measures that were absolutely necessary in order to gain results. That was no small job.

Thirdly, it was his business, and it is still, to see that the necessary funds are forthcoming, with regularity, so there will be no interruption in the progress of the work. That is no small job.

Dr. Wight referred in his report to two New England states, New Hampshire and Connecticut. It would be entirely fitting and proper, I think, to extend congratulations to New Hampshire and all the other states which have moved over into the 100 per cent column since we last met. We New England fellows rather look forward to an invitation to come to New Hampshire and celebrate this great accomplishment, but apparently on account of Yankee economy and Yankee modesty, it was forbidden.

We have at this time in the New England States two states in the 100 per cent column: Maine and New Hampshire. Of the four remaining states, Vermont leads with 75 per cent tested, under supervision. Massachusetts and Connecticut are running neck and neck, 63 and 65, respectively. Rhode Island is close on our heels with Drs. Robinson and Lewis in the saddle, and it looks as though it is going to be a hot finish, with 57 per cent. When we average it all up through the New England States, we have 76 per cent under supervision.

Dr. Wight mentioned in his report the percentage of cattle infected with tuberculosis ten years ago, which was 4 per cent, and it has now been reduced to 1.4 per cent; 1.4 per cent is 35 per cent of 4 per cent, so that means there has been a gain of 65 per cent in ten years. If we base our future operations on our past performances, with all things equal, we ought to have the job done by 1938, that is, if our gain is $6\frac{1}{2}$ per cent each year for the past ten years.

Now we go over to Connecticut. Connecticut's infection, that is, the percentage of infection to the total population of the cattle in the state of Connecticut ten years ago, was 30 per cent. It has now been reduced to 10 per cent. As a matter of interest, 10 per cent is $33\frac{1}{3}$ per cent of 30, which means that we have gained $66\frac{2}{3}$ per cent against 65 per cent throughout the whole nation, which we feel is keeping pace with the program.

On October 1, 1932, Connecticut declared its first modified accredited area, and that was the County of Hartford. In order to modify that area it was necessary to remove 16,749 cattle, out of a population of 33,440, at an expense of \$669,960 to the State for indemnity alone, to say nothing about the federal expense, and they are sustaining one-third of the cost of some of the work they did and their proportion of the indemnity. So you can use that as a basis to determine just what the eastern states have been up against in the eradication of this disease.

There is one thing that we consider paramount in our tuberculosis work, and that is that the closest attention be given to the herds and the areas that have been cleaned up. We feel that if we do not make a close follow-up on our retests, the gain is only temporary. That is one thing we advise our neighbors and all of the state officials we come in contact with, that perhaps have not had the percentage of infection that we have had in the New England States; regardless of that, it is necessary that you follow up at regular intervals.

There is one more point right along this line, and that is we have noticed it has been the policy of some states to advance their initial test, to the extent that they have not been able to make their retests within the necessary time, so that a considerable number of reactions have come, that is, unnecessarily so, on retest. The check on the efficiency of your initial testing and your clean-up is reflected in the percentage of your reaction on retest. The latest record I have of the retests in the state of Connecticut was from January 1 to July 1, 1932, which gave us 1.1 per cent. We feel that if we can keep our reactors down to 1 per cent or somewhere around that figure, we are doing good work, but when they get up to 2 per cent, we begin to worry. We begin to think there is something wrong somewhere and start looking for it, as was recommended in Dr. Wight's report, to run down sources of infection.

We found that most of the sources of infection that were giving us trouble and breaks in accredited herds were due to improper cleaning and disinfecting at the time the initial test was made. That is one thing we are very fussy about in Connecticut—proper cleaning and disinfecting. We feel that if that is not carried out, that is, to the extent that every possible accumulation and every crack and crevice is cleaned and properly disinfected, we are bound to have trouble later. The farmer will perhaps tear off some side boards or rip up the floor and loosen some accumulations that have been there for years. You know and I know that under favorable conditions a tubercle germ will live a long time.

There have been two ahead of me on this work of eradication, and I don't want to repeat a lot of things that you are not interested in and just take up your time. I just want to make one more remark and that is in regard to the public health factor in the eradication of tuberculosis, which has been a very popular appeal in Connecticut and all through the New England States. The public sentiment that has been behind this work has been responsible for substantial appropriations. It has been responsible for at least 20 to 25 consuming communities passing ordinances requiring milk from tested herds. The demand for testing in our state is so great that we cannot possibly keep up with it. We have at all times 10,000 head on file waiting for our men to do the work. As you know, we cannot work any faster than funds permit. We have our limits.

With the assistance of public sentiment, the public health factor, and the able cooperation from the federal authorities, the Chief of the Bureau and his associates, which has been of great encouragement to all state officials, we have been able to accomplish considerable that otherwise would have been very difficult without this support.

PRESIDENT MALCOLM: We are privileged to have with us today some laymen from the Far West who are interested in the work that we are doing. We have on the program Mr. F. E. Mollin, secretary of the American National Live Stock Association, of Denver, Colorado.

I want to assure you, Mr. Mollin, that I feel confident this Association will deal fairly with you, with one thought in mind, that of protecting your interests in the eradication of bovine tuberculosis. (Applause)

MR. F. E. MOLLIN: Mr. Chairman and Members: In preparing a paper for the meeting this afternoon it was my aim to be entirely fair. I did not attempt to pick out here and there a set of figures that might help prove our point. I secured practically all my data from the Bureau of Animal Industry and supplemented them with reports from the individual states west of the Missouri River by writing to the state association secretaries affiliated with our organization, and they, in turn, getting the information direct from their sanitary officials.

. . . Mr. Mollin read his paper. . . .

ACCREDITING RANGE AND SEMI-RANGE CATTLE AS TUBERCULOSIS-FREE

By F. E. MOLLIN, Denver, Colorado

Secretary, American National Live Stock Association

The year that has passed since representatives of various western live stock organizations appeared before your Committee on Tuberculosis has witnessed much progress in the work of tuberculosis eradication, and in the knowledge of the most efficient manner in which this work can be carried to a conclusion in the range and semi-range areas of the seventeen western states. I think you will grant that your interest in this matter cannot possibly exceed that of the people whom I represent. We are the ones who will suffer and who will pay for any mistakes made, regardless of who makes them. We realize fully the urgent necessity for stopping the agitation in regard to tuberculosis in cattle, and for working out, at the earliest possible moment, regulations for the handling of stocker and feeder cattle interstate, with a maximum of safety and protection to all, and a minimum of unnecessary expense.

It is our firm belief that great damage has been done to the industry by unnecessary and illogical restrictions on the movement of cattle, and by placing undue emphasis on the danger of reinfection by purchasing animals coming from the naturally clean areas of the West, unless such animals have first been subjected to the tuberculin test. The consuming public is very sensitive to any mention of disease in connection with its meat supply, and no doubt the constant publicity in regard to tuber-

culosis has been one of the factors contributing to the decline in beef consumption.

The efforts of the live stock commissioners attached to many of our central markets, who have widely heralded their overenthusiasm in the matter of establishing accredited areas in the range country, and largely exhausted their original field of activity, have helped to create the impression in the East that a dangerous condition exists, and that emergency action is demanded. Nothing could be farther from the truth. The natural reaction to all this tumult has been an excess of caution on the part of eastern buyers. Many who formerly bought cows to clean up odd supplies of roughness in the fall will not bother to unwind the red tape now necessary to acquire possession of them, and thus a stout prop has been knocked from under the market for she-stuff. Others will not buy in the central markets for fear of acquiring disease, although there is no basis for such fear. If the same amount of time and money had been spent in informing eastern buyers of the truth relative to the natural freedom from disease of western range and semi-range cattle, ample proof of which has long existed, and of their superior quality and hardihood, we should all be faced with a much simpler problem today. There is a danger-point in the load which any industry can bear in the way of regulations, no matter how well intended; and that point has now been reached.

The Bureau of Animal Industry and your Association are to be congratulated on the remarkable progress that has been made in cleaning up bovine tuberculosis through the medium of eliminating infected animals from the farm and dairy herds. In the fifteen years from 1917 to 1932, the percentage of condemnations, minus known reactors, at federally inspected plants has declined from 0.45 to 0.098. The constant decline in this percentage in recent years indicates that the final cleaning-up of farm and dairy animals will remove the question of bovine tuberculosis from its present unfortunate position in the spotlight. The statement issued by the Bureau on October 6, showing that less than one-third as many of the cattle slaughtered under federal meat inspection for the fiscal year 1932 were affected with tuberculosis as was the case ten years ago, proves both the progress made in cleaning up farm and dairy herds, and the relative absence of the disease in range and semi-range herds.

Another optimistic statement was issued by the Bureau of Animal Industry on April 28, 1932, calling attention to the steady progress being made, and postponing indefinitely the regulations, previously approved, providing for the testing of all feeder

cattle moving into quarantined areas after July 1, 1932, except that this was not to apply to areas where the incidence of disease was estimated to be not more than 1 per cent until July 1, 1934. Much of the testing done in range areas last spring would not have been undertaken except for the fact that stockmen were told that they would have to comply with these orders. However, the results obtained furnished a valuable record which it was essential to have in order to work intelligently in the future. The statement of April 28 concluded with these words:

In the meantime surveys will be continued in order to obtain more information on the presence or absence of tuberculosis infection in range cattle.

Before going into a study of the reports available from this survey, which was later initiated by the Bureau, I should like to take up the question of the results of testing done in the field. It is our claim that the disease is not a natural attribute of our cattle, and that the conditions under which we operate, instead of being conducive to its development, tend to promote vigor and disease-resistance. The old law of nature, "the survival of the fittest," still rules on the range; and the Belden pictures, shown here a year ago, told the story of just how "fit" that is.

In almost every instance where tuberculosis has been found in range or semi-range cattle the infection has been traced to the importation of breeding or dairy animals. A great deal of it was due to the outrageous dumping, some years ago, of dairy stock, known to be infected, from east of the Missouri River into various parts of the West. The centers of infection thus created now have been pretty well cleaned up, and the stricter regulations in force today as a result, together with the completion of your program of testing farm and dairy animals, will remove this source of trouble.

We believe that the figures given below as to the results of testing already done in the field, coupled with the result of the packing-house study, fail to prove the wisdom or necessity of testing hundreds of thousands of clean cattle in accordance with the present plan.

The report of the Bureau for the years 1917 to 1930 shows that, of 74,870,664 cattle tested in the United States during that period, 2.6 per cent reacted. Taking the seventeen states west of the Missouri River, 14,225,833 cattle were tested, mostly dairy cattle, of course, with only 1.2 per cent reacting; indicating that even the dairy herds in those states are much freer from disease than is the case in the East. For the year 1930 alone the margin in favor of the western states is even greater, 1.7

per cent of all cattle tested reacting, with only 0.62 per cent in the western states. For the year 1931, 1.5 per cent of all cattle tested reacted, with only 0.57 per cent in the western states.

For the year 1932, 1.9 per cent of all cattle tested reacted, with 1.1 per cent in the western states. During that year, of the 21,015 reactors in the western states, 12,837 were in California alone, where a hotbed of infection was struck in dairy herds. The higher percentage for the entire country was partly due to this sharp increase in California, and partly to increased activity in New York, where the percentage of reactors was 5.3, against 3.3 the previous year.

While the Bureau and certain of the states do not appear to have detailed records, segregated as between farm and dairy cattle, on the one hand, and range and semi-range cattle, on the other, I give you such detailed information as I have been able to get.

Dr. Mohler advises that, in the work which has been done in Utah, no tuberculosis was found in range herds. This state has many small herds, and comparatively few large ones. About one-fourth of the total number of cattle are of the dairy type, so that the chances of mixing are greater than in most of the range states.

In Arizona little testing has been done, except in dairy cattle. A few semi-range cattle have been tested in Apache, Navajo, Cochise and Greenlee counties, with about one-tenth of 1 per cent reacting, except in Cochise County, which showed three-tenths of 1 per cent.

In Montana, 230,327 "other than dairy cattle" were tested in the years 1921 to 1931, inclusive, of which 635 reacted, or 0.27 per cent. Range, semi-range and farm cattle are included in the classification.

Dr. Williams advises that, in six counties already accredited in the Dallas area of Texas, approximately 20,000 range cattle were tested, and only 10 reactors found, or one-twentieth of 1 per cent. In the recent testing in the Panhandle, some 24,000 range cattle were tested, without a single reactor. Will anyone seriously contend that such a showing demands and justifies the continuance of this program among the almost 5,000,000 beef cattle in that state?

In three range counties in process of accreditation this summer in Oklahoma, 27,242 cattle were tested, showing 65 reactors, 27 of which were dairy cattle.

In New Mexico approximately 12,000 range and semi-range cattle have been tested, with 35 reactors.

From Oregon I have a report of 2,000 cattle being tested in the Klamath Basin a year ago, with five reactors, four of which had been imported from California the previous year. In the past two or three months some 3,500 additional range cattle were tested, and no reactors found.

Even in Idaho, where infection was introduced into semi-range cattle, mostly Shorthorns, some years ago in Lemhi County, in the manner described above, less than one-half of 1 per cent of the total number of cattle tested from 1919 to June, 1932, reacted. Of 1,000,487 cattle tested in the State, only 87 of the 4,770 reactors were Herefords—the dominant breed in the range country, and apparently the least susceptible of all to the disease. In the past two years, Dr. Mohler states, only a very slight degree of infection has been found among the range cattle in this State.

In Nevada, during the four-year period ending 1932, 74,807 range cattle were tuberculin-tested in connection with area work, and there were found 208 reactors (0.28 per cent).

In the state of Washington, during the period January 1, 1929, to September 30, 1932, 248,099 range or semi-range cattle were tuberculin-tested, revealing 1,447 reactors (0.58 per cent).

In the state of California considerable infection has been found in range and semi-range cattle originating in the foot-hill districts of the San Joaquin Valley. It is the theory of the Chief of the Division of Animal Industry of that State that these cattle have become infected through mixing with dairy cattle which have been turned out for feeding in this region. The map shows very heavy infection in the dairy cattle of that State, and as long as there are opportunities for mixing, it is entirely possible for the disease to be found in the various types of cattle. This simply shows the necessity of keeping to the original plan and cleaning up the farm and dairy animals in the country as fast as possible. When that is done, the range and semi-range cattle will give a good account of themselves wherever located. Insisting that we should begin a long, expensive program of testing range and semi-range cattle because they do show signs of infection where given the opportunity of mixing with dairy cattle known to be infected is putting the cart before the horse.

In other western states, such as Nebraska, Colorado, South Dakota and Wyoming, either very few range and semi-range cattle have been tested, or there is no segregation of the records, so that I have been unable to get information of value. In North Dakota some tests were applied to range cattle in connection

with area work in a few counties west of the Missouri River, where a very slight degree of infection was found.

Coming now to the packing-house study, requested by western live stock interests, suggested in the B. A. I. order of April 28, and put into effect July 1 at Chicago, South Saint Paul, Sioux City, Saint Joseph, Omaha, Kansas City and Denver, under charge of Dr. Herman Busman: This is not a new departure, but simply a logical gathering up of loose ends, and an expansion of the present work of tracing diseased animals back to the point of origin. It is the only infallible test. Each year the old cows and the culls from western herds—far more susceptible to tuberculosis than the choice feeders that are shipped to eastern feed-lots—go to the packing-plants, where the inspectors read the story of their lives as the dressed carcasses pass before them.

We already had an indication of what to expect from Dr. Busman's study. For the fiscal year 1931, 2,015,440 cattle, exclusive of known reactors, were inspected at Denver, Fort Worth, Kansas City and Omaha, of which 679 carcasses (0.034 per cent) were condemned. Eliminating Kansas City and Omaha, with their greater numbers of farm and dairy cattle, we find 362,341 cattle inspected at Fort Worth and Denver, with 70 carcasses (0.019 per cent) condemned.

For the fiscal year 1932, 1,868,923 cattle, exclusive of known reactors, were inspected at the four western markets, of which 497 carcasses (0.027 per cent) were condemned. Taking Denver and Fort Worth alone, there were 354,945 head inspected, with 45 carcasses (0.013 per cent) condemned.

The first figures available as a result of Dr. Busman's study show autopsies performed, between July and October, inclusive, on 53,889 cattle, identified as originating in range areas, out of a total of 322,632 received at the markets under survey and similarly identified, or about 17 per cent of the total receipts of range cattle. The great majority of the 83 per cent no doubt were feeders, and did not go to the packing-plants. But we urge that a careful postmortem examination of 17 per cent of the total animals received, when that 17 per cent is largely made up of the old cows and bulls from the entire herds, which would show infection if it were there, is a much better check on the true condition existing in those herds than can possibly be obtained the present plan of field testing. In practical application, the present plan is to test as many of the bulls and pure-bred animals as can be found, and 10 per cent, if possible, of the range breeding females, taking whatever animals are most convenient to handle, without regard to age. I know of one

instance where agents in the field have offered to test only yearling heifers, in order to accredit one of our large western herds. The plain truth of the matter is that even the modified plan is not practical in many parts of the West, and cannot be honestly complied with.

One hundred and twelve carcasses are reported as disclosing tuberculosis: 33 from Colorado, 38 from Nebraska, 18 from Wyoming, and the remaining 23 from Kansas, Montana, New Mexico, Oklahoma and South Dakota. No trace of the disease was found in any animal from Texas. Of the 112 carcasses, only 17 were condemned, or 0.031 per cent of the total examined. Of the 33 cattle from Colorado, 19 were from a feed-lot at Julesburg, and the infection appeared in glands of the head. These cattle originated in Yuma County, and Dr. Lamb immediately had 137 animals from the herd tested, without a single reactor. The disease, therefore, originated in the feed-lot and not in the range herd. Most of the remainder had skin lesions, with only two or three showing typical lesions of bovine tuberculosis. In Wyoming, 12 of the 18 animals were from one herd of Durhams, and it is believed the infection was introduced through the purchase of bulls a few years ago. In Nebraska, 14 of the 38 were from one herd. I have had no opportunity to get detailed information on the Nebraska record, but representatives from that State are here today, who, I hope, can give us further information of value.

It would seem that the above figures speak for themselves. They demonstrate that range cattle are naturally free from tuberculosis; that practically all outbreaks have been traced to the entry of infected breeding animals; that the present incidence of the disease in range or semi-range areas is very low—a mere fraction of the one-half of 1 per cent established as a basis for 100 per cent accreditation; and that its occurrence has constantly declined as farm and dairy herds have been accredited. The study of packing-house records conducted by Dr. Busman and his assistants, together with the information previously available along the same line, clearly indicates a much lower incidence of tuberculosis in range-cattle areas than exists in many of your 100 per cent accredited states. It plainly shows that the method of accreditation through packing-house records is practical and economical, and fully meets the needs of the situation which now exists. It was not to be expected that 100 per cent efficiency would result immediately, but it is gratifying to note that splendid coöperation has been extended to Dr. Busman and his assistants at the various markets. Given a little more time

to educate all interested in the details of the plan, we can expect even better results in the future than those already obtained. It will not be difficult to perfect a proper method of tracing.

I quote again from the Bureau bulletin of October 6:

"Since federal meat inspection is recognized as a test of the health of market live stock, the comparative figures show the effectiveness of the nation-wide campaign of eradicating tuberculosis from live stock," say officials of the bureau of Animal Industry, U. S. Department of Agriculture, *who also point out the similarity between the results of field surveys and federal meat-inspection records. In both cases the proportion of tuberculous cattle in 1932 was found to be about one-third that of ten years ago.*

Certainly that indicates that the Bureau has found the packing-house system a reliable index of conditions.

The present situation has forced cattlemen to practice the most rigid economy in every operation. It should and will compel both state and federal governments to do likewise. In the face of the negligible number of condemnations at markets where range cattle predominate, plus the clean record of field testing described above, we do not believe that either state or federal governments are justified in appropriating large sums of money to continue the present plan, as far as range and semi-range cattle are concerned. As to the cattleman, he has not the money to add one penny to his present costs. I am sure that stockmen and sanitary officials in those western states which have already done considerable testing would welcome a more simple plan of keeping a check on the disease—one that would combine economy and efficiency.

Our objection to the present system, however, is not based solely on economic grounds. There are many ranges and ranches so operated that it is a physical impossibility to test all the bulls, and where it would be, to say the least, an arduous undertaking to test 10 per cent of the breeding females, which would be truly representative of the entire herd. In many instances it would require a considerable outlay for equipment otherwise unnecessary. The main objection, however, to the testing of millions of cattle, as remarkably free from disease as this record shows, is not the expense of the equipment, nor the material cost of the labor involved, but the very substantial shrink in handling and rehandling the breeding herds.

We do not desire accreditation by deceit, but by the most practical, economical and efficient method that it is possible to devise. The interests of cattle-feeders in the Corn Belt and eastern states will be much better protected by a careful tracing-back of diseased animals from the packing-house to the ship-

ping-point than by a system which at best checks only a small portion of the herd. Areas have recently been declared accredited when it is a well-known fact that several of the largest herds have not been touched. The plan which we recommend, properly administered, will beyond a doubt show the animals affected with typical lesions of bovine tuberculosis. That is what you are after. All that remains is to perfect the system of tracing to the point of origin.

In your deliberations on this matter, I ask you to consider the facts that there are more than 20,000,000 beef cattle in the seventeen western states; that the beef-cattle industry is the major industry in many of these states; and that great care and attention have been given to improving the quality and excellence of the herds, until we now produce the finest cattle in the world. The West is proud of its cattle and envious of its reputation. It shall be our aim to continue to supply the finest raw material that the Corn Belt feeder can buy.

In closing, I desire to thank Dr. Cotton and the other members of the Committee for the privilege of appearing here. Yours is a great responsibility. Thousands upon thousands of producers are affected by your decisions. We urge you to consider every side of this problem, the acute need of economy, the welfare of the entire industry, and then to coöperate in working out a plan which will command the full support of all concerned.

DISCUSSION

Dr. F. H. BROWN: I have been very greatly interested in the matter at issue as it has been presented by the secretary of the American National Live Stock Association, and should like to compliment him on the complete manner in which he has presented his case from the standpoint of a salesman. I am convinced that he is a firm believer in his cause as well as the merchandise offered.

I regret not having had more time to devote to the subject, but from a rather hasty review of Mr. Mollin's paper it appears to me that in the final analysis he is asking us to discard a system which has been in operation for almost sixteen years, and on which millions of dollars, derived by taxation, have been expended and which has proven to be the best system ever devised for the eradication of a disease that was rapidly destroying one of the foundation stones of all our agricultural activities, and accept in its stead a program which is as yet practically untried, and which, in my opinion, would fail utterly to produce the desired result, which is the ultimate eradication of tuberculosis among our cattle.

If the cattlemen in the 17 states, to which Mr. Mollin refers, were the only persons to be taken into consideration, his proposition, with some reservations, might be acceptable, but there are 31 other states in which the live stock interests are at stake, and which are entitled to some consideration, not only for the future protection of their cattle, but because the greater portion of the money expended has come from these states.

I cannot agree with the statement that the western cattlemen are those who will suffer most from any mistakes that may be made regardless of who makes them. I am very firmly of the opinion that whatever plan is adopted for the eradication of tuberculosis in range and semi-range cattle, such a program must be effective to the end of complete eradication. Otherwise, the importation of untested feeding cattle, or cattle from an area not known to be free from tuberculosis, into the Corn Belt and other states will be a potential danger to our modified, accredited areas, thus calling for the possible double expenditure of money to bring the control of this disease back to its present status.

I have no desire to question the figures presented relative to the percentage of bovine tuberculosis in range or semi-range areas. We accept now, as we have heretofore, that the percentage of tuberculosis among range and semi-range cattle is relatively low, but the records prove that there are sections in these states where tuberculosis exists to a greater degree than the percentage shown in our modified, accredited areas. In support of this statement, Indiana records show, in more than a million tests applied during the past two years, only 26/100 of 1 per cent infection was found, and while western areas in which most of our feeding cattle now originate show, in some instances, a similar percentage of infection, or even less, it is our purpose to carry the work forward in Indiana to the point of complete eradication. Thus, we are interested in eliminating every possible outside source of re-infection. Furthermore, we are now aware of practically all centers of infection throughout the State, and herds that show infection are maintained under a rigid quarantine and are being retested at stated intervals. We propose to continue along this line until complete eradication has been accomplished, and I contend that up to the present time all of the infection on the western range has not been uncovered. Neither will it be until a systematic program of tuberculin-testing has been carried out.

To me a program of tuberculosis eradication founded upon kill records in the packing-house will tend only to retard the gathering of information which our cattle-feeders throughout the nation should be provided with today, and that is, "Where can they buy feeding cattle that are free from tuberculosis?" Furthermore, the expense of such a program, if adopted, will be largely borne by the federal government, and the taxpayers in 31 states not classified as range states will be called upon to pay their proportionate part of the expense, which would be obviously unjust. While, as heretofore stated, only 26/100 of 1 per cent infection is shown in our Indiana herds, we are not asking other states, such as New York, with more than 5 per cent infection, to accept our cattle without a tuberculin test; neither do we think it is just for western cattlemen to ask our cattle-feeders to accept their cattle without at least some assurance that they are as free from disease as are our cattle, as shown by actual tuberculin test.

I join very heartily with Mr. Mollin in extending congratulations to the Bureau of Animal Industry and the members of this Association in the remarkable progress that has been made in the elimination of tuberculosis from farm and dairy animals, and am taking this opportunity to point out that this record has been made by the actual application of the tuberculin test, and in my opinion it could not have been made in any other manner. Therefore, naturally we hesitate to accept any substitutes.

I hold no brief for the Bureau of Animal Industry. Neither do I claim to have any inside information as to their operations, but I am of the opinion that the rescinding of the regulation calling for the tuberculin test on range and semi-range cattle moving interstate, re-

ferred to by Mr. Mollin, was brought about because of disturbed economic conditions rather than by any remarkable progress that had been made in the eradication of the disease among range cattle, or because of any hope that a better plan might be devised.

Mr. Mollin seems to favor the discontinuing of agitation relative to tuberculosis in cattle and its relation to public health. Personally, I prefer to give this subject wide publicity, even to the extent of instructing our children through the public schools and otherwise that they and their children, down through the ages to come will not repeat the costly mistakes our forefathers made in not placing this disease under control years ago. I prefer to teach the public that the tuberculin test, plus meat inspection, as carried on under our present federal meat-inspection laws, are the most reliable means at hand which may be used to provide meat and milk reasonably free from tubercle bacilli.

Publicity through the press and otherwise in the past fifteen years throughout the nation, indicating that the consumption of milk produced by the tuberculous cow may result in the spread of tuberculosis to the human family, did not result in the refusal of the public to buy and use milk. In fact, milk consumption increased almost every year until the present financial depression overtook us. Apparently the consuming public was made to realize that the diseased cattle were being located by the use of the tuberculin test and slaughtered and dairy products made more wholesome. Therefore, I disagree with those who believe that the agitation relative to tuberculosis in dairy or range cattle has affected our markets, except where the cattlemen failed or refused to eradicate the disease from their herds.

In our State the feeder-cow market has been affected, no doubt, due to the fact that this type of cattle imported into our State in the past has shown a rather high percentage of tuberculosis and in some instances has been responsible for the spreading of the disease to our native cattle. Thus, we now maintain a rigid quarantine on imported feeder cows, and where they cannot be maintained as a separate unit we insist on tuberculin test. Furthermore, we have pointed out to our cattle-feeders that there is more danger of infecting their premises as well as native herds when this class of feeders is handled. With this information our cattle-feeders in a large degree are refusing to buy untested feeder cows. Most other states will not permit these feeder cows to enter without tuberculin test.

If we take Dr. Busman's report as indicating what we may expect from feeder cows from western ranges, we believe their action is fully justified. I note from Dr. Busman's report that out of 60,626 range cattle slaughtered under federal inspection 117 showed lesions of tuberculosis on postmortem, a small percentage to be sure, but let us not forget that the western cattleman is seeking a market for his cows, and Dr. Busman's report shows further that 95 of the 117 diseased cattle were females. Furthermore, 63 (66 per cent) were cows. In addition, of the 16 animals shown in Dr. Busman's report as condemned, 14 of them were cows. With this information at hand can there still remain a doubt in the minds of the western cattleman as to what may be destroying his she-stuff market?

Range and semi-range type cattle are not free from tuberculosis as our western friends, on various previous occasions, have attempted to point out. This fact is proven by kill tests submitted in the paper presented. Thus, we, in the Corn Belt and other states, have not been misinformed by any person or group of persons relative to the danger of reinfecting our breeding and dairy herds by importing untested feeding cattle.

Mr. Mollin's statement, that the tracing of centers of infection

through packing-house records is the only infallible test, is to me little less than astonishing, and indicates that he is not fully conversant with the facts known to those educated through years of experience on packing-house floors where thousands of reactors have been posted. It is admitted by those familiar with tuberculosis eradication work, in its various phases, that the tuberculin test properly administered and intelligently interpreted is decidedly more reliable than post-mortem examinations, even though these examinations be conducted by trained inspectors. One of the circumstances, not ordinarily understood by laymen, in connection with tuberculosis eradication work, is that many animals which react to the tuberculin test fail to show macroscopic lesions of the disease on postmortem examination. This does not mean necessarily that the reactor does not carry tubercle bacilli, but means rather that working conditions, as they obtain in the average packing-house, do not afford an opportunity for an examination so minute in character as to discover the disease often existing in an incipient form, which has no meat-inspection importance. If it is claimed that an animal of this character is not a potential danger, I reply that such an animal, while not dangerous today, may become, within a comparatively short period, a spreader of the disease. With these facts before us I contend that the system proposed does not even approach infallibility.

All states importing feeder cattle, including Indiana, take the position that regardless of how small the percentage of tuberculosis found in range cattle, it is in the interest of the range cattle owner to locate the infected herds and eradicate the disease if he expects to enjoy his present feeder market. We believe that tuberculosis, once introduced into range herds, will not spread so rapidly as in herds maintained in feed-lots and dairy barns. Nevertheless, tuberculosis once introduced, and no reliable eradication plan followed thereafter, the disease remains to spread in the herd. Therefore, we are not ready to subscribe to the theory that fresh air, sunshine and beautiful scenery is a guarantee that you can produce cattle free from tuberculosis.

The statement made that in almost every instance where tuberculosis has been found in range and semi-range cattle the infection has been traced to importation of breeding and dairy cattle from east of the Missouri River certainly does not mean that the western cattleman now desires to send infected cattle back to our clean herds. Mr. Mollin points out that regulations governing the importation of breeding and dairy cattle into the range territory have been strengthened, thus attempting to avoid establishment of new centers of infection on the range. We desire to avoid the establishment of new centers of infection in our clean herds by insisting upon the importation of feeding cattle free from tuberculosis.

We, in Indiana as well as other states, paid and are still paying for our shortsightedness in the past in permitting the importation of tuberculous cattle. Possibly our Indiana herds became infected with tuberculosis through the importation of breeding and dairy cattle from the East and some of our neighboring states. No doubt the herds in the eastern states became infected through the importation of cattle from over-seas and before federal regulations were so worded as to offer reasonable assurance that cattle imported under such regulations would be free from tuberculosis.

After spending a large sum of money eradicating this disease from our Indiana herds, including the application of thousands of tuberculin tests and the location of approximately 30,000 reactors upon which the State expended better than three quarters of a million dollars in the way of indemnity, to say nothing of the cost to the public through taxation of approximately the same amount in federal indemnity, and

to say nothing of the cost of administration, we are now asking that proper federal regulations be passed and enforced to give our herds the protection which they should have received years ago. Does the western cattleman contend that we are not justified in demanding protection for our people who have been taxed to produce the revenue by which our State has been made a modified accredited area? I, as the constituted authority in the state of Indiana, feel it my duty to take every possible precaution to protect our herds and our people.

Thirty-nine out of 92 Indiana counties showed 30/100 of 1 per cent infection, or less, on the last complete test. One county failed to reveal a single reactor; others showed very few diseased animals in the tuberculin-testing of several thousand cattle.

The entire state is a modified accredited area. It is of grave importance to our live stock industry, as well as the health of our people, that we not only maintain our present modified accredited tuberculosis-free status, but proceed further and carry this disease program to complete eradication, thus contributing our part to a program which is now, has been for almost 16 years, and which must continue to be, a program national in scope.

Some of our cattle-feeders have been misinformed through some source relative to the regulations of the Bureau of Animal Industry, pertaining to the eradication of bovine tuberculosis in range cattle. Only recently in discussing the importation of this type of cattle with one of our Indiana feeders, I learned that he was of the opinion that disease control officials of the East were insisting that the western cattleman apply a tuberculin test to his entire herd. He was informed as to what was required relative to the testing of 10 per cent of the females and all of the bulls, and I might say that he seemed surprised to know that he could purchase feeding cattle from modified accredited tuberculosis-free areas, and such cattle could be moved into the state of Indiana without quarantine. Useless to say, he proceeded to purchase some 400 head of feeding cattle from modified accredited range territory.

Approximately 130,000 feeding cattle moved into the state of Indiana during the past fiscal year for further feeding purposes. All of these cattle, except those from modified accredited areas, regardless of sex, are maintained under quarantine and must be fed, watered and housed separately. If such a program cannot be carried out by the cattle-feeder, then the cattle must be tuberculin-tested. This is not red tape, but it is common sense methods used in protecting a vast financial investment, as well as human health, and particularly so if many feeder cows were to be imported.

Ninety-one range counties, located in eleven western states, are now modified accredited tuberculosis-free areas. Tuberculosis eradication is now in progress in 15 additional counties, making a total of 106 counties, with a cattle population of approximately 2,250,000.

In the past, all worth-while live stock disease control programs have been laid before the stock-owners of our State, through their various organizations, and I desire to point out that all live stock disease control plans of the past have been sold to the industry as a whole before they were inaugurated.

We, in Indiana, are not assuming to dictate to the western cattlemen. We believe, however, that we are entitled to tuberculosis-free feeding cattle. Therefore, we propose to contact the Farm Bureau organizations, stockyard companies, sale-barn managers, cattle-feeders and individuals engaged in importing feeding cattle, through the public press and otherwise, and sell them the idea, and point out the advantages to be derived in importing nothing other than feeders from modified accredited areas. We started this program of education in connection with

our cattle-feeders on or about September 1, this year, and in spite of the short duration of the educational program, more than 2,500 feeders originating in modified accredited areas have entered our State in the past 90 days.

These feeding cattle from modified accredited areas have been imported from Oklahoma, Arkansas, Montana and New Mexico, by only four of our importers. You, no doubt, will readily recognize that the importer, as well as the feeder of cattle originating in a modified accredited area, has an advantage over his competitor who may be purchasing cattle upon which quarantine or tuberculin test must be applied after entering our borders. These cattle from modified areas can be imported and resold without quarantine or tuberculin test, when such shipments are accompanied with proper health certificates. One importer and feeder has even gone to the trouble of striking handbills, selling this proposition to hundreds of cattle-feeders in his community. It reads as follows:

HEREFORD CATTLE!

STOCKERS and FEEDERS

DIRECT

From the Range to My Farm!

**ALL FROM ACCREDITED HERDS—
NO QUARANTINE!**

See Before You Buy!

Punch Them Out to Suit Yourself

FINANCING

**25 Percent Down—Balance at 6 Percent
When Fed Out.**

Geo. O. Rafert Farm

FORTVILLE, INDIANA,

Phone Fortville No. 50.

COME SEE THEM!

Call at Stone House North of Fortville, State Road 238

I TRY TO KEEP SEVERAL HUNDRED HEAD ON HAND ALL THE TIME
FOR YOUR SELECTION.

He not only uses that as a poster but that is his handbill. I should like to add here that I personally know there is \$250,000 behind this movement. It is not a fly-by-night concern. This man and myself are very close friends, and I have an opportunity to find out about

all of his transactions. He is one of the honest cattle-dealers that we have in Indiana. (Applause)

As further evidence that our Indiana cattle-feeders are anxious to receive cattle from modified accredited areas, thus minimizing the possible danger of importing diseased animals, upon which quarantine is not necessary, I desire to say that it is nothing uncommon to receive inquiries by telephone or letter from cattle-feeders or veterinarians in localities in which cattle of this class have moved, seeking information as to why the cattle are not placed under quarantine. Their gratitude in being able to purchase this class of range feeders is always manifested in their reply.

All business, large and small, pays for its own mistakes and at times possibly the mistakes of others, some of which are reflected in the sale price of their merchandise. I am not ready to admit that any person or business suffers in preparing a product which will meet with universal satisfaction when used. Most all business suffers a decline in volume sold if merchandise fails to satisfy the consumer.

We desire to be reasonable and fair relative to this subject. However, it seems unfair and unreasonable to ask that range cattle move interstate for feeding purposes from areas not modified and without tuberculin test.

PRESIDENT MALCOLM: Discussion on this question will be continued by Mr. J. Elmer Brock, president of the Wyoming Stock Growers' Association, Kaycee, Wyo. (Applause)

MR. BROCK: Mr. President and Members: When I appeared before you with fear and trembling a year ago, from off the plains of Wyoming, I was accorded such a hearty welcome and such consideration that I came back again and brought with me a few other range men who are here, whose ideas conform to my own in the problem which we have up before you for discussion.

Before I proceed with what I have in mind, I should like to reply to a few of the remarks made by Dr. Brown. In listening to the records of retests of modified accredited areas in the East, and comparing those with a good cross section which is given us by the Bureau of Animal Industry through Dr. Busman's work, I am wondering whether the western range cattle are a menace to the modified accredited areas in the East, or whether the eastern modified accredited areas are a menace to the cattle of the West. In that test, which is, as I say, a good cross section, we have something like three-tenths of 1 per cent, largely among cows, and about 2/100 of 1 per cent of condemnations, which, if I heard correctly, is much better than many of the modified accredited areas in the East.

As to the demands by the feeders, I don't think there has ever been a time in my life when the feeder buyers were cutting across and avoiding the central markets as they are today. Our country is full of them, from Iowa, Illinois, and I talked with a man the day before I came here whose neighbors have just sent a big string of cattle to Indiana. I said to him, "Was there any question raised by those men who bought the cattle as to whether or not they had been tested, or as to their health?"

He said, "Not one question was raised."

He did not know what became of them when they got to Indiana. The same condition is true in our country. Those buyers never question the health of our cattle. What the regulations do to them when they get here, I have no knowledge of whatever. But those men are paying, as I learned to my sorrow, 50 cents a hundred more than the price of those cattle on the central markets, rather than bring them through there. I learned that just this week, at an expense of \$800. That, gentlemen, is the attitude of all the eastern buyers that we contact in that country.

I was also privileged to be engaged in some work with a man who was a state senator for eight years in Iowa, from the county where they had to call out the troops. He told me they ought to call out the Regular Army to test those dairy cattle, and he said they ought to use the same forces, if necessary, to prevent the testing of feeder cattle.

In regard to our mission here with you gentlemen, we came down here a year ago asking your recommendation for a certain plan to be put into effect by the Bureau of Animal Industry for giving us information from postmortem records on the market, to show whether we were or were not guilty of harboring infected cattle and, if so, to what degree and where. You gentlemen gave us the consideration of making that recommendation. It has been put into effect, and it has accomplished, in my opinion, wonderful results.

When it is all summed up, we are interested not in the methods but in the eradication of disease. I think, gentlemen, you have made several years of progress through this method that you could not have made had you confined your activities solely to your present method of range testing.

The results which have been so gratifying to us, I am told by Dr. Mohler, are to be continued indefinitely, as far as he knows at the present time. They have indicated, as we suspected, some sources of infection. Dr. Busman tells me that he is able in almost all cases to identify range cattle, which was thought to be an impossible thing.

To give you some idea of the degree of efficiency to which that has already gone in my own state, five different shipments of cattle were found on postmortem to be infected. Those cattle were shipped under the names of different individuals, not five but two or three, and in every instance they all traced back to the same source. In other words, there were five checks on one man. Our State Veterinarian tells us that that herd is being 100 per cent tested, or probably has been at this time, and we are sure he will continue that kind of work wherever a source of infection shows up.

Gentlemen, had not this plan been put into effect, that herd and the other sources of infection would have been there for a number of years before they had detected it or made any effort to clean them up. That is why I say you are making greater progress than you could make by any other method.

As to the method you people have applied in the East, I don't question but what it is the most practical, but this is a big country. There are many conditions under which we have to labor. We grow different kinds of crops. We have different climates, and we should have different methods, if they are practical. I don't think we should be sticklers for a method if some other method can be applied as successfully, owing to other conditions in other sections of the country.

This whole problem, as I see it, has two sides, one of which is the technical side, which, as a layman, I don't even consider myself qualified to discuss. The other is the practical side, and I think the practical stockmen can advise with you gentlemen and offer some very constructive suggestions. That is why we are here. After considerable deliberation, we have come before your Committee on Tuberculosis and offered two suggestions. I don't know what shape those suggestions will be in when they come out of the Committee so I am going to give them to you as we offered them today.

First, since, as you know, you have free and accredited herds, we propose, through the method of postmortems, to accredit our range and semi-range cattle as a class. We offered the following:

"All range and semi-range cattle in the range and semi-range areas be accredited when postmortem reports from the various packing es-

tablissements under federal supervision reveal the percentage of tuberculosis to be less than one-half of 1 per cent, provided that the sanitary officials of the range and semi-range areas agree to tuberculin-test all herds in which tuberculosis was found upon postmortem examination."

That is one of our problems, gentlemen, and it is going to take care of about 90 to 95 per cent of our cattle, and the cattle in which we have the least chance of infection, and, by the way, a group which you will not be able to get to if you were dependent upon state coöperation solely, for many years to come, for economic reasons. That is one suggestion we have to offer. It is not very far afield from your own plan other than it is reached by a little different route.

We have another suggestion as to accrediting areas in our state, which conforms very closely to your plan:

"That areas in range and semi-range districts may be accredited when all milk cows, pure-bred breeding cattle and barnyard cattle are tuberculin-tested and the percentage of tuberculosis among such cattle and among the range and semi-range cattle in said areas, as evidenced by postmortem findings, is reduced to less than one-half of 1 per cent."

That is the other suggestion which we have offered the Committee on Tuberculosis. Gentlemen, you are going to make more progress by this method than in any other way, for economic reasons. I will give you an example in my state, which I don't think is peculiar in the western states. We have a state-wide organization of indignant taxpayers demanding a 50 per cent reduction in taxation. The stockmen are not going to be able to fly in their face successfully, to any extreme degree. They have already accomplished a 15 per cent reduction. That was inspired by one condition alone, which I will give you as an example.

Twenty-one per cent of all the lands and improvements in the state of Wyoming are now owned by counties, from tax sales; no one would bid them in, so the counties had to bid them in themselves. There is a condition that is actual and real, and you gentlemen cannot question but what it has a direct bearing on this problem.

If you will agree to our suggestions, while there may be some alterations in the minor details of the methods which you have found so successful in the East, it is certainly going to expedite, several years, the eradication of tuberculosis which is, after all, our main objective.

I want to thank you gentlemen again for the consideration which you have shown me as a layman and also my friends who are here with you today.

PRESIDENT MALCOLM: Now, ladies and gentlemen, we have heard from the West. We have heard of their troubles, trials and tribulations. We want to be fair in this proposition. There are other states in the Union, other than Indiana, that are interested in tuberculosis work. Therefore, I am going to go back East and ask Dr. Faulder, of New York, what tuberculosis has caused them and their cattle-owners and about what it has cost to bring it to the point where it is now.

DR. E. T. FAULDER: The President has asked me to comment on what it has cost the State of New York so far in eradicating bovine tuberculosis. New York was one of the early states to inaugurate tuberculosis eradication upon the advice of this Association and that of the federal Bureau of Animal Industry. From 1918 up to about 1921, there was nothing really spectacular that happened in New York. We started in on gradual work. We started on an educational program. We sold the idea to the cattle-owners and, from 1921 up to the present time, we have made exceptional progress.

We have in New York State 2,220,000 cattle maintained in 62 counties and 922 townships. We have, tuberculin-tested one or more times,

as a result of our intensive campaign, 128,000 herds out of 160,000 in the State, or approximately 70 per cent. We have reduced tuberculosis as a result of this intensive campaign from approximately 30 per cent in 1918 to about 10 or 11 per cent at the present time. That has cost the taxpayers of New York, up to the present time, \$41,000,000. That does not include the amount of federal indemnity paid by the federal government.

We have spent out of county funds, for maintaining county veterinarians up to the present time, another \$1,500,000. We have covered 90 per cent of the townships, and in those townships the cattle have been tuberculin-tested one or more times, or 90 per cent of the total.

We have at the present time 12 counties declared modified accredited, and those counties, as a result of retest, produced approximately four-tenths of 1 per cent of reactors, in spite of the fact that we have 10 per cent tuberculosis remaining in 15 counties. Out of the 128,000 herds under the plan, 81,000 have been declared modified accredited and are retested annually.

We have another group of 38,000 herds that passed one successful test, leaving 7,000 herds which revealed reactors on the last test. We have 22 counties which will be eligible for modification during the next 12 to 15 months.

So far this year we have completed the initial test in another group of 13 counties, and that leaves 15 counties where the initial test is still incomplete. Those are the intensive dairy counties up through the central part of the State where the percentage of infection today averages 50 per cent.

Summing up, we have 30,000 untested herds today of a little over 600,000 cattle. Fifty per cent of those cattle are tuberculous. Tuberculosis is found upon 60 per cent of those premises.

We have removed, since 1918, 612,000 tuberculous animals. Of that number, 36,000 were found to be suffering from generalized tuberculosis. Take your pencil and figure out how many trainloads that would be, putting 25 generalized cases in each car, and I guess you will realize that we have tuberculosis in New York State.

Our present plan is to complete our initial test program by 1936, that is, providing our Legislature provides the money, and I have assurance they are going to. As a result of our educational campaign we have sold this idea to the cattle-owners. They realize the many advantages of maintaining herds free from tuberculosis. It is their full intention to continue the campaign until the last tuberculous cow is removed from the farm.

I cannot help but comment on the suggestion of Mr. Mollin. I disapprove of that plan of attempting to modify any state as the result of postmortem examination. We have told our people that the post-mortem examination is for the purpose of determining whether that carcass is fit for food. We also tell them when we find a no-lesion case that even though no macroscopic lesions were found, the disease was there some place, that the test is more accurate than that postmortem. We are going to continue to tell that to the people. We do not want that story brought back east to New York or the adjoining states (where we have to tuberculin-test our cattle a certain number of times in order to modify that area), that out West they can modify the state without testing. The first thing we know the State of New York is going to ask us why we spend \$400,000 a year to tuberculin-test accredited herds annually. We are doing that, of course, to protect the investment of \$41,000,000. They are going to ask us, if this story gets back, why we have to spend \$400,000 to retest our accredited herds, if in some state in the West all they have to do is postmortem a few cattle to determine whether or not they are tuberculous. That

is the serious objection to such a plan. I protest against such a plan. I think the plan should remain uniform as was started by this Association, and carried through to completion with little or no modification.

PRESIDENT MALCOLM: Let us get back to the Middle West. I should like to hear from Dr. Wisnicky on conditions in Wisconsin.

DR. WALTER WISNICKY: I have given only a little attention to this proposition of accrediting the Western herds, so I don't believe I can speak with any definiteness on the subject.

As you all know, Wisconsin is now a completely modified accredited area, and we have a cattle population of three and one-quarter million. We apply one and one-quarter million tests annually. A good many tests are applied annually to herds where there is reasonable assurance that they are free and those localities are reasonably free, but we still continue to apply those tests because we know of the value that lies therein. We want to protect that enormous investment which we have made in this work.

Wisconsin has invested over \$15,000,000 in this tuberculosis-eradication work. We believe the investment was a wise one and that we should continue to protect the work that we have carried on up to this point.

The plan, as I heard it here this afternoon, certainly is not complete enough or definite enough to warrant any amount of consideration. I think we should be absolutely fair with sections of the country where conditions are different. If some safe and reasonable plan can be worked out, I think we should give it full consideration and the decision that it merits.

When the concession was made that the areas would be accredited on the basis of testing ten per cent of the cattle, I think that was quite a concession. I think that many areas could have gone ahead and accomplished something and received recognition on that basis. You western people must remember that those of us who have gone ahead with this tuberculosis-eradication work also had enormous problems to surmount. We test approximately 108,000 herds every three-year period, and the sum total of the effort to get those cattle into the barns and test them is an enormous task. Those cattle likewise suffer some adverse experiences that must be taken into consideration. I know you have your problems, but you must face this thing, realizing that you are the people who are looking to certain sections for a market. It is always a good business plan to try to satisfy the people to whom you are selling your product.

The regulation that was recommended here last year to compel a test on all feeder cattle that do not originate in modified accredited areas seems, to us, to be a reasonable one. You must keep in mind that those of us who have modified accredited areas have to exert efforts to protect that interest. When you ship in cattle that are not from modified accredited areas, we have to place a quarantine on them and thereby incur an expense to the taxpayers of our state, and the man who imports those cattle must operate under a quarantine. As I see it, the expenditure is considerably in excess of the expenditure that it would cost to test those western cattle.

Of course, the point may be brought up that those western cattle are difficult to test. We have had a little experience in testing your western cattle. We have several counties that feed a considerable number of cattle from the West. When we test those counties we test all of those Western cattle except those that are about ready to go to market, that is, within a week or so. So we have had the experience of testing your cattle, and we know that they can be tested. We know that there is infection there. In some of the feed-lots we take out

3, 4, 5 and as high as 7 per cent, and that 7 per cent, by the way, came from the South Saint Paul yards, and I don't want to blame Dr. Cotton for that, because I believe they came from some place farther west.

There is the situation, gentlemen. I believe that we should give you proper consideration, but the plan that is presented, as I have heard it, is one on which we should not spend much time. It would have to be more complete, more conclusive and exacting.

Here is a suggestion: If there are certain large herds in the West that you say you can get to the packing-houses and get a packing-house record (I am just thinking and speaking offhand), if you can get 10 per cent of those cattle into the market and examine 10 per cent from that individual unit and actually have a definite record on John Jones' 10 per cent of 2,000 range cattle, then you have a definite record.

If your plan is such that it would cover every situation and every herd in that area, that you would test all herds of a certain size and under, say 50 head and under, and for all herds of 50 head or over you could have some reasonable, practical plan whereby you would either test 10 per cent of those cattle or could send 10 per cent from that particular herd into the market and clear that particular herd, and have a record on every herd in the area, then the plan would approach a point whereby we could give it more consideration. (Applause)

MR. MOLLIN: Some may not have grasped the fact that this plan does call for the testing on the range of all cattle that are around the premises, that is anything that would come under the head of milk cows or barnyard cattle, any old bulls that might be around the premises. That is contemplated. It would seem to us that the plan would give a pretty fair indication of what the range cattle are. I am very much encouraged by the suggestion Dr. Wisnicky just made, that there might be something worked out there. I think Mr. Brock told you he did not know what the Committee on Tuberculosis had done on this thing, but it was our suggestion as a starting point. The exact application of it, of course, is something we could not predict or attempt to dictate.

DR. E. L. STAM: I should like to make a little statement on this subject. Last year I had the privilege of attending your meetings for the first time.

When this subject was discussed I made the statement that all the range cattle men of the West desired to do was to ship you cattle that we believed to be already cleaner than the cattle in your modified accredited areas. I still stand on that.

We have had a sad experience with our dairy cattle. Arizona was used as the dumping ground for tuberculous cattle from the states of the Mississippi Valley and the Atlantic Seaboard for many years. We have found entire shipments of cattle to be reactors. We have found cattle coming into Arizona with health certificates, with reactor tags in their ears, from states east of us. We have practically cleaned our State of tuberculosis in our dairy cattle.

There are in Arizona fourteen counties. At the present time, in nine of those counties there is less than five-tenths of 1 per cent of infection. In our routine work of going through those counties we have not only tested strictly dairy cattle, but we have gone out onto the ranges and tested the cows that were supplying milk for some of the cattlemen's families, though I will admit the majority of our cattlemen still milk with a tin can.

In our settlements along our irrigated sections we have tested thousands of cattle that you might class as range or semi-range cattle.

But some of our people are of the opinion that just because they milk a cow, it is a dairy cow and we have tested them.

In our mountainous sections, where most of our range cattle business exists, we have found the infection as low as one-tenth of 1 per cent, and in Graham County, the last time we went through, we did not get a single reactor in 4,000 cattle classed as dairy cattle. We continually watch our slaughtering establishments. In the event they find an animal showing lesions of tuberculosis, that is immediately reported to our office and we run it down. There is not only a sanitary end to this business but there is a sort of moral issue at stake.

We feel that before you compel our citizens to dig down into their almost empty pockets and raise a huge sum of money to tuberculin-test our range cattle, you should first present to us evidence to show conclusively that there is a sufficient percentage of infection in our range cattle to warrant such an expense, a sufficient infection that would endanger cattle of other states. We are not trying to fight disease eradication.

If you go into any portion or any state of the United States and mention the word "Arizona," the first thought that comes to your listener's mind is "That is where we send our sick folks when they get tuberculous." If there is anything in our sunshine or in our soil or in our atmosphere that will restore your loved ones to health, send them to Arizona, but don't, for God's sake, ever accuse us of trying to fight disease eradication.

PRESIDENT MALCOLM: Gentlemen, this question has been very well discussed today. It is in the hands of the Committee on Tuberculosis, and, as I understand it, the Committee will report tomorrow. Therefore, we will adjourn until nine o'clock tomorrow morning.

. . . The meeting adjourned at 5:25 p. m. . . .

RECESS

FRIDAY MORNING, DECEMBER 2, 1932

The fifth session convened at 9:35 a. m., President Malcolm presiding.

PRESIDENT MALCOLM: We will start with the subject of "Transmissible Diseases of Poultry." The first paper is "Endemic Paratyphoid Infection in Turkeys," by Dr. Leo F. Rettger, Yale University, New Haven, Conn. (Applause)

. . . Dr. Rettger read his paper. . . .

ENDEMIC PARATYPHOID INFECTION IN TURKEYS

By LEO F. RETTGER, *New Haven, Conn.*

Department of Bacteriology, Yale University, and Department of Animal Diseases, Storrs Experiment Station

There is a large group of bacteria known as the paratyphoid B group, and hardly a year passes in which a new member or type is not added. Well known among them are *Bacterium* or *Salmonella schottmülleri*, *S. enteritidis*, *S. suipestifer* and *S. aertrycke* (sometimes referred to as the mutton type).

All of these are known to affect man, and, with the possible exception of *S. schottmülleri*, have caused severe losses in many

of the lower animals, particularly sheep, swine, chickens, ducks, pigeons, canaries and other birds, and guinea pigs and mice. Indeed, it may be said that few animal species enjoy full immunity.

Paratyphoid infection in the lower animals constitutes a common source of infection in man which often assumes the character of so-called "food poisoning." The human infection may be acquired through direct contact, but more commonly through food which has been contaminated by the feces or by parts of the infected animals which are served as food.

Paratyphoid infection should not be confused with hemorrhagic septicemia, which is caused by an organism of the *Pasteurella* genus. This genus is widely disseminated, and plays an important pathogenic rôle in both man and the lower animals. In man it occurs as *P. pestis*, the cause of bubonic and Manchurian plague; in barnyard fowl as *P. aviseptica*, or the organism of fowl cholera or hemorrhagic septicemia; in cattle as *P. bovis septica*; in swine as *P. suis septica*, and in sheep as *P. oviseptica*. The general characteristics of the infecting organism and of the disease are quite different from paratyphoid, the outstanding symptoms of which are usually those of so-called food poisoning. The immunological reactions of the two are also decidedly different. But let us return to the original subject.

Pullorum disease, or bacillary white diarrhea of ordinary barnyard fowl, is caused by a paratyphoid organism, *S. pullorum*. Its extreme economic importance is well known to us all. It still remains to be shown that infected birds constitute a source of infection for man, and hence a public-health menace. The specific organism, therefore, cannot be classed as yet in the group of so-called "food poisoning" bacteria.

Extensive epizootics of paratyphoid infection in ducklings have been studied in various sections of the country, particularly in Massachusetts, Connecticut and Long Island. These have been found to be caused by paratyphoid bacteria of the *S. aertrycke* and a very closely-related type.

Very few bacterial diseases have been known to affect turkeys. Indeed, it has long been the prevailing opinion that if turkeys can be protected against serious blackhead invasion, little thought need be given to losses from other diseases.

The paratyphoid epizootics which constitute the major part of the subject matter of this paper occurred on two New England turkey-farms situated about 90 miles apart. These will be referred to as farms A and B.

HISTORY OF RECURRING EPIZOÖTICS ON FARM A

Turkeys have been grown on this farm for about eleven years. The first evidence of an apparently infectious disease, aside from blackhead, occurred in the spring of 1929, when about 25 per cent of a lot of 200 young poults died. No turkeys have been brought on the farm since 1920 or 1921, except 400 young poults in 1924, and a few adult toms which were purchased in February, 1931.

In the spring of 1930 there were about 1,000 breeding birds, from which 18,000 poults were obtained. The disease soon attacked the young poults in a very acute form, causing a loss of 12,000 poults (66 per cent), during the breeding and rearing season. The mortality in the later hatches was only about 25 per cent.

About 3,000 poults were hatched in 1931, of which 1,200 (40 per cent) died from apparently the same cause. The 1932 hatches totaled 2,600 poults. By the end of July 400 (15.4 per cent) had died. The disease, while still present, as was shown by the isolation of the paratyphoid organism from affected poults, was decidedly less severe than in previous years.

During the last five years, with the exception of 1930, the young stock was put into small brooder-houses which connected with small outside runs provided with wire-screen floors. In 1930, day-old chickens were purchased from outside the State and kept in these houses and runs. They were infected with pullorum disease. During this rearing season the young turkeys were kept in a large brooder-house some distance away from the small houses, and on high ground.

SYMPTOMS AND POSTMORTEM APPEARANCES

These were apparently the same in each recurrent outbreak. Some of the poults died within 24 hours after hatching. The highest mortality occurred before the poults were ten days old. After the first week the mortality rate dropped with increasing age. Relatively few losses occurred after six weeks, although occasional deaths were noted much later.

Affected young poults appeared to be chilled, and crowded close to the hover. Many were seemingly normal in the evening, but were found dead on the following morning. Where the progress of the disease was not rapid the poults were weak, their wings drooping and their movements sluggish. Diarrhea, although noted at times, was not a constant feature.

There were no definite macroscopic lesions in the affected

poults. The liver was congested at times, and there was some inflammation of the upper portion of the intestine. The ceca were at times filled with cheesy matter, but were not spotted, necrotic or congested. Most of the postmortem examinations were unsatisfactory on account of the more or less altered condition of the tissues and organs, due to shipment of the specimens over rather long distances.

The infection was for some time assumed to be pullorum disease, especially since chickens had been brought on the farm in 1927, and since some of the symptoms were suggestive of *S. pullorum* infection.

In 1927, the turkey stock appeared to be weak. Cod-liver oil was administered as such. Since then the oil has been fed in the mash. For a while, since then, the poultry feed was under suspicion, but change to a new, standard brand did not result in improved vitality and fewer deaths.

With the exception of the one year, 1930, the young turkeys were kept and reared in houses and adjoining wire runs which were located on low ground close to a ravine. This ravine was more or less wooded and, although the brooder-houses and runs were not directly under the trees, they were near enough to the wooded growth and the ravine to interfere with their receiving abundant sunlight, aeration and proper drying. Furthermore, there was over-crowding of the houses, especially when the poults attained considerable size. In short, the conditions were such as would naturally lower the vitality of the poults and increase their susceptibility to infectious disease.

HISTORY OF RECURRING EPIZOÖTICS ON FARM B

A survey of the situation here soon showed that the paratyphoid infection was introduced from farm A through young poults.

In May and June, 1929, about 2,000 small poults were purchased from farm A. From the 5th to the 21st day, from 20 to 25 per cent of the poults died. The symptoms appeared in some respects to be similar to those of pullorum disease, and suspicion was cast on chickens that were being kept on the same farm, but apart from the turkeys. Consequently, 3,600 mature chickens were tested for pullorum disease, with negative results.

In the spring of 1930, eggs from 500 breeders held over from the 1929 stock were hatched. The first hatches sustained only a small loss, about 10 per cent.

In May of the same year, 900 young poults were purchased from farm A. Within the first 24 hours, 84 of the poults died; in the

next 24 hours, 172, and in the next, 315. The owner refused to purchase more poults from the same source, on the supposition that the stock on farm A was infected with pullorum disease.

In the same hatching season (1930) 1,200 small poults were purchased from a different source. They were reared in separate houses and on new ground, and about 90 per cent were brought to full maturity. Of 8,000 poults hatched from survivors of the 1929 infected broods, over 50 per cent died, most of them apparently from the same disease.

In 1931, there was a recurrence of the infection in the young stock that was hatched from breeders held over from 1930. The losses were fairly heavy in the earlier broods, and continued on a rather limited scale into the months of July and August.

It has been estimated that the losses on farm B during the period 1929-1932 totaled at least 10,000 poults. Very young poults were particularly susceptible; the mortality rate decreased in general with increasing age of the broods. The turkeys did not seem to be safe from serious infection even after they attained the age of 7 or 8 weeks.

An organism was isolated from five different lots of dead poults sent to the Yale Laboratory of Bacteriology, which was apparently identical with the strain obtained from poults received from farm A. The various strains from the two farms were subjected to the usual identification procedure, including morphological, cultural, biochemical, serological and virulence studies.

DESCRIPTION OF THE ORGANISM CAUSING THE DISEASE

It is a Gram-negative, non-sporulating, gelatin-non-liquefying rod which, when grown on the ordinary culture media, is shorter than typical *S. pullorum*. It occurs singly, as a rule. It is stained readily by the ordinary anilin dyes. It ferments glucose, maltose, xylose and mannite, with both acid and gas formation, but does not attack lactose. It browns lead acetate medium. It produces a slight initial acidity in litmus milk, which is followed by alkali production. It does not produce indol.

On the basis of the above characteristics, the organism was classed as a member of the paratyphoid B group. It cross-agglutinated in high dilution with stock strains of *S. aertrycke* and with *S. anatum* (B or aertrycke type), but not with the A type of *S. anatum*, and did not cross-agglutinate with *S. enteritidis*.

A somewhat extensive series of agglutinin-adsorption tests finally enabled us to place the organism definitely in the classi-

fication scheme as *Bact.* or *S. aertrycke* (sometimes called *Bact. pestis-caviae*), or the mutton type of paratyphoid.

Animal feeding and inoculation experiments showed that the organism possessed a high degree of virulence for young turkey poults, white mice, guinea pigs and rabbits, when introduced by the subcutaneous or intravenous route. Young poults (under 8 to 10 days old), mice and guinea pigs were very susceptible also to oral administration of the organism, the feeding resulting in generalized infection (septicemia) and death of the animals. The organism was isolated with ease from the blood and internal organs.

SOURCE AND MODES OF TRANSMISSION OF THE INFECTION

It appears quite obvious that farm A was the immediate source of the paratyphoid infection. It must always remain a question how the stock on this farm first acquired the disease. The organism may have been introduced in turkeys brought in from the outside, or through other animals, either domestic or wild, as for example birds of the air and mice.

We cannot escape the conclusion that the organism, after it made its invasion on farm A, established itself permanently by becoming localized in turkeys which survived infection, particularly the ovary. Unfortunately, the opportunity has not presented itself as yet for us to extend our investigation to maturing and breeding stock, or to eggs from one or both of the infected farms.

The situation is quite analagous, it would seem, to that which obtains in pullorum disease transmission and spread, and to the disease in ducklings which is caused by *S. anatum*, a paratyphoid bacillus which is identical with, or very closely related to, the organism of the turkey disease. In both of these instances, the infection is transmitted from the laying hen or duck to the young, through infected egg-yolks. Newly hatched chicks or ducklings become sources of infection in other chicks or ducklings with which they are brought into contact. Quite recently pigeon eggs also have been shown to be infected with *S. aertrycke*, which has been found to be the cause of serious losses in pigeons.

The decidedly unhygienic conditions which existed on farm A may account in a large measure for the apparent ease with which the disease organism invaded and permanently established itself on this farm. Being thoroughly intrenched in the turkey stock on this plant, introduction of the disease into farm B through infected poults from farm A was but a natural step to the ushering in of a situation here that was similar to the one on farm A.

It should be said, however, that the sanitary conditions on farm B were apparently good, aside from overcrowding of the houses and the wire runs.

The work reported here today will be published in greater detail by Dr. Plastridge, Miss Cameron and myself, in a scientific journal or in a Storrs Experiment Station research bulletin.

DISCUSSION

DR. RETTGER: In spite of the title that went in on the program, I intended not to discuss blackhead in connection with this paper, but with your permission I will make a few general statements.

New England seems to be coming into its own again as far as blackhead of turkeys is concerned. Ten years ago, it was the general impression throughout the East that turkey-raising was a lost science and art. If you go through the New England States today I think you will be surprised, if you knew the situation ten years ago, at the many flocks, mostly small, some large, of turkeys that are being raised on farms.

The blackhead problem seems to have been relegated more or less to the past, I mean as far as ordinary blackhead in turkeys is concerned. The etiology of blackhead has been studied to quite a great extent. The most recent contributions were those of Tyzzer of Harvard, and his associates who have claimed that *Histomonas meleagridis* is the cause of blackhead. We accept that for the time being at least.

Our work at the Connecticut Experiment Station was limited to epidemiological studies. We spent some fifteen years on the study of blackhead. In practically that entire period we applied a rotation system, and for many years we thought this would be the solution of the blackhead problem. I may say here briefly that by rotation you will be able to prevent many losses from blackhead that would occur and do occur on ground that the turkeys are allowed to occupy continuously. But in the first ten or twelve years of our epidemiological study, circumstantial evidence presented itself again and again that the ordinary barnyard fowl is a menace to the turkey.

In Bulletin 148, published in 1927, we brought this out in the paragraph that follows: "There can be little doubt that chickens and other barnyard fowl transmit blackhead disease and that ground that has been and is occupied by them constitutes an immediate source of infection."

We did not appreciate the circumstantial evidence that was at hand until we went over all of our notes of the preceding ten or twelve years before this bulletin was written, and the circumstantial evidence stood out so boldly that you might say it almost jumped into our faces. We took it as circumstantial evidence, but enough evidence to modify our plan of turkey-raising on the experimental plan, to the extent of introducing ordinary barnyard fowl into one of the control yards and keeping the barnyard fowl in that yard during the greater part of the winter season, in between the turkey-raising seasons.

In the one year's investigation that followed this winter housing of chickens in one of those yards and its house, we had a tremendous mortality. I think over six times what we had in the rotation yard which at no time had been exposed to chickens or other barnyard fowl, aside from turkeys.

This one experiment of 1927 and '28 or 1928 and '29 convinced us that the only way to rear turkeys is to put a ban on chickens on the

same farm or certainly on the same ground. Other institutions are following their own ideas there, but I believe it is quite generally taken for granted that chickens and turkeys are incompatible companions, that is, the chicken, while ordinarily resistant to the organism, we will say, *Histomonas meleagridis*, is a carrier to the extent that wherever the chicken is allowed to roam, the organism is eliminated, and with animals or birds that are as susceptible as turkeys to blackhead infection, the protozoa are picked up. They make their entry through the ceca and establish what we call "blackhead."

I believe that the main problem of blackhead in turkeys has been solved in the recognition, by different institutions as well as ourselves, of chickens as a real menace to the turkey and to the turkey industry. Going on this supposition, quite a number of New England turkey-raisers have been extremely successful in raising turkeys, whereas, 15 or 20 years ago, the turkeys of New England had practically disappeared.

Coming back to the paratyphoid situation on these two main farms, I am inclined to believe that the problem here is not altogether one of keeping out aertrycke or this mutton type of paratyphoid bacilli, but it is one or should have been one of strengthening the resistance of the turkeys on farm A instead of growing the turkeys under conditions that would make for lesser resistance and greatly increased susceptibility to this paratyphoid bacillus. The paratyphoid bacillus of the mutton type seems to be quite generally distributed in nature.

When we buy white mice for experimental purposes, and other animals as well, we always have in mind the possibility of those animals carrying the aertrycke or some other type of paratyphoid B organism. Birds of the air and animals in which we have not recognized this carrier condition carry this organism; some of these species become victims to the infection; others do not react sufficiently to the organism or the disease to be recognized as a paratyphoid or any sort of disease.

I have felt for some time, in connection with turkey-raising and our limited studies of coccidiosis in chickens, that we are defeating our own purpose more and more, and the turkey-raiser is going to do it in the future if he does not realize the danger.

As turkey-raising becomes easier from the practical standpoint, there will be more turkeys. Along with this, the idea of keeping young turkeys on wire-screen floors in the runs and in the houses has taken a very good foothold also. That also, to a large extent, may prevent blackhead in young poults, but the tendency there is to grow the turkeys in overcrowded conditions. I know that was true on both of the farms referred to in my paper.

I stated early in the paper that the turkeys seemed to be weak. They were given cod-liver oil, which was followed in subsequent years by a mash feeding that contained cod-liver oil. There was every probability there that the stock had become extremely weak and that any real disease or pathogenic organism that might be prowling around would easily gain entrance and produce serious results. That applies not only to turkey-raising but I believe it applies to poultry-raising in general.

The more successful the manager or the owner is in poultry-raising, of course, the larger is the production, the more birds and eggs the market will have to take care of; the more birds will be put into the same runs and the same houses. The tendency is to overtax these houses and runs.

The economic pressure that is brought to bear, especially during a period of depression such as we are going through, will make for lesser resistance in the birds generally. Production is another thing that has become—I don't want to say a hobby; it is a wise thing to keep in

mind, to get all that you can out of a flock or out of a herd in the way of meat, eggs or milk and butter, but there is a limit to which such a flock or herd can be pushed.

I am seriously of the belief that many of these so-called newer diseases that we encounter in poultry, particularly, are to be laid at our own doors or the doors of the poultrymen. (Applause)

PRESIDENT MALCOLM: The next paper, "Experiments on Immunization Against Laryngotracheitis in Fowls," by Dr. F. R. Beaudette and C. B. Hudson, of the New Jersey Experiment Station, will be read by Dr. L. M. Roderick. (Applause)

. . . Dr. Roderick read the paper. . . .

EXPERIMENTS ON IMMUNIZATION AGAINST LARYNGOTRACHEITIS IN FOWLS

By F. R. BEAUDETTE and C. B. HUDSON
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In earlier experiments various methods were employed in attempts to bring about active immunity against laryngotracheitis. These may be classed as follows:

- a. Subcutaneous injection of active virus.
- b. Infection of the conjunctiva.
- c. Infection of the upper respiratory tract of birds held at about 40° C.
- d. Modification of virus by passage through another host.

The results obtained with these various methods were not sufficiently encouraging to warrant further investigation. It is true that a few birds inoculated subcutaneously never took the disease later when inoculated intratracheally, but it seemed likely that an unobserved mild infection might have been responsible for the immunity rather than the subcutaneous injection. Furthermore, there was no reaction following the subcutaneous injection, which seems to us necessary for active immunization.

In many cases it was possible to set up a mild infection of the conjunctiva by direct inoculation which was followed by immunity, but occasionally the disease process would extend to the larynx or trachea before sufficient immunity had developed. Inasmuch as this could not be controlled, the method was considered too hazardous.

The holding of birds inoculated intranasally and intratracheally at about 40° C. almost always resulted in a mild attack of the disease as already reported,¹ but because of the necessary environment such a method would be practical only in the case of young birds. Furthermore, the mortality was not insignificant.

An attempt to modify the virus by passage through another host was not successful but should be investigated further. A virus passed through a pheasant-Bantam cross and then through a pheasant still retained its virulence for fowls.²

Finally it was found possible to infect the mucosa of the cloaca and bursa of Fabricius by direct swabbing. As already reported,³ virus from such an infected cloaca could be used to set up a similar process in the cloaca of another bird or laryngotracheitis in case of intratracheal inoculation. Such a virus was carried from cloaca to cloaca through a series of birds and on each passage a bird was inoculated intratracheally. When the birds were tested for immunity at the close of the experiment, it was found that those which survived intratracheal inoculation (4 out of 5) were immune to cloacal infection, and those which had recovered from cloacal infection were immune to intratracheal infection. At the time of this inoculation, the birds had received their immunizing dose 11 to 27 days previously. Both controls took the disease and one died.

Our experiments from this point on have made use of cloacal infection as a means of immunization, and the following experiments are selected as typical.

Experiment 1: The birds were Rhode Island Reds, hatched in November and reared in an electrically heated and ventilated chickroom within the poultry building. The caretaker never came in contact with any other birds, which was deemed necessary to avoid infection of any kind.

On February 13, 10 of these birds were placed in a colony-house and infected in the cloaca by swabbing. The virus (Pasiac strain) used was collected on December 16, or 59 days previous to its use, dried, and held in the freezing chamber of an electric refrigerator. The virus was used at the rate of 4 mg per cc of diluent (50 per cent glycerin).

On February 16, the inoculated birds were examined for evidence of cloacal infection and only one (Y 277) was considered negative. On February 20, 12 additional birds from the same lot were added to the population. Two of these (R 819 and R 802) were inoculated intranasally to serve as a source of infection, and from this time on daily observations were made to determine the spread of infection.

Of the birds inoculated in the cloaca, only one (Y 277) showed symptoms of infection. These were first observed on February 26, and the bird died on March 2. The spread of infection in the non-vaccinated lot is recorded in table I.

TABLE I—*Spread of infection in non-vaccinated lot.*

BIRD	INOCULATED INTRANASALLY	FIRST SYMPTOMS	RESULT
R 819	2-20-32	2-23-32	Died, 2-27
R 802	2-20-32	2-23-32	Recovered
R 807	Controls	2-24-32	Died, 2-25
R 824		2-24-32	Recovered
R 820		2-25-32	Recovered
R 803		2-25-32	Recovered
R 815		2-25-32	Recovered
R 818		2-25-32	Recovered
R 805		2-25-32	Recovered
R 821		2-26-32	Recovered
R 808		2-26-32	Recovered
R 813		2-26-32	Died, 3-4

From these results it can be seen that every bird which showed a "take" absolutely resisted the infection and every control took the disease.

Experiment 2: In this experiment the vaccinated birds and controls were exposed to infection by intranasal inoculation. Twenty birds hatched February 11, and reared as in the previous experiment, were vaccinated on March 29 by the cloacal method and placed in one section of a battery. The virus (Ramsberg strain) was collected from birds which died in another experiment between March 9 and 12, and was used at the rate of 4 mg per cc of diluent. The vaccinated birds were examined for cloacal infection April 2 and all were judged to be positive. Vaccination did not affect the birds in any way.

On April 8, 20 additional birds from the same lot were placed in another section of the same battery and these, together with the vaccinated lot, were inoculated intranasally with 0.1 cc of the same virus used at the rate of 2 mg per cc of diluent.

Every bird in each lot was examined on April 13 and exudation recorded as occurring in the right or left eye, right or left sinus, nasal cavity or trachea. In order to conserve space, suffice it to say that, of the 20 non-vaccinated birds, 19 showed typical exudation in one or more of the parts recorded above. Incidentally, the right eye was involved in 7 cases and the left in only 2, the right sinus in 8 cases and the left in only 2. This involvement of the right side rather than the left may be explained by the mode of inoculation. The bird was held breast up under the left arm and the pipette directed through the nasal cleft and to the right. The nasal cavity was involved in 16 cases and the trachea in 10. Four of these birds died as follows: 2 on April

15, one on the 16th, and one on the 17th. All showed typical lesions on postmortem examination.

Of the vaccinated birds not a single one ever showed evidence of the disease. Individual weighings were made of the vaccinated lot on March 29, and of both lots on April 8 and 18. The average weight is expressed in Table II.

TABLE II—Average weight of vaccinated and non-vaccinated lots.

DATE	VACCINATED	NON-VACCINATED
3-29	635.6 gm	—
4-8	794.5 gm	871.68 gm
4-18	894.38 gm	894.38 gm

From these results it can be seen that 100 per cent of the vaccinated birds resisted intratracheal infection, whereas 95 per cent of the controls definitely took the disease and 4 (20 per cent) of them died. The weights show that, in the 10-day period between March 29 and April 8, the vaccinated birds made an average gain of 158.9 gm, which would not indicate that their growth was seriously disturbed by the vaccination. In the next 10 days this group made an average gain of 99.88 gm, as compared with an average gain of 22.7 gm in the survivors of the non-vaccinated group during the period when they were affected by the disease.

Experiment 3: This experiment did not differ materially from the one above. The birds were from the same hatch, but, of course, 9 days older at the time of vaccination. The same virus was used for vaccination, at the rate of 4 mg per cc of diluent. Thus, on April 7, 28 birds were vaccinated and placed in a 10x12 colony-house. The tail of each vaccinated bird was clipped for the purpose of identification. Examination on April 11 showed infection of the cloaca in every bird. On April 18, 10 control birds from the same hatch were added to the population and each of the 38 birds given 0.2 cc of a virus suspension intratracheally, containing 100 mg of virus per cc of diluent.

Within a few days after the test inoculation, the difference between vaccinated and non-vaccinated birds was most striking. When one entered the house the vaccinated birds ran in all directions while the non-vaccinated ones hovered together in one corner beneath the dropping-board. This striking difference was constant and persisted for several days. Every non-vaccinated bird showed typical symptoms of laryngotracheitis and 4 (40

per cent) died as follows: 2 on April 23 and 2 on the 24th. Each showed a caseous membrane in the trachea on postmortem.

Of the vaccinated birds not one showed the slightest evidence of the disease, but, on April 16, one was found dead. On autopsy the respiratory tract was free of any sign of inflammation. However, there was a severe hemorrhagic inflammation of the rectal mucosa. The mucosa of the cloaca appeared normal, but a caseous plug was found in the opening of the bursa of Fabricius. Whether this was the result of vaccination or not cannot be definitely stated, but in all probability it was.

Experiment 4: In the first three experiments the vaccine contained 4 mg of virus per cc of diluent. This amount was reduced to 2 mg per cc in experiment 4, in which 76 Rhode Island Reds of Feb. 11 hatch were vaccinated on April 26. The vaccine was made from the same virus as that used in experiments 2 and 3, plus virus collected from the four dead birds in experiment 2. The birds were leg-banded and confined to a 10x12 colony-house.

The first examination to determine takes was made by one of us on May 2, or 6 days after vaccination, and a reading recorded for each bird. The following day another reading was made by a second observer without reference to the previous reading. The results were recorded as positive or doubtful, it being impossible to say whether the latter was slightly positive or negative. The results are given in table III.

TABLE III—Results of two readings by different observers on 76 birds.

BIRDS	READING BY B, MAY 2	READING BY H, MAY 3
36	Positive	Positive
19	Doubtful	Doubtful
20	Positive	Doubtful
1	Doubtful	Positive

From table III it can be seen that there was complete agreement in the readings on 55 birds, that is, 36 positive and 19 doubtful. Of the 21 birds on which there was disagreement, 20 were recorded as positive on the first reading and doubtful on the second, while in only one case was the first reading doubtful and the second positive.

It is to be observed that the first reading was made 6 days after vaccination, whereas in experiment 1 this was made 3 days after and in experiments 2 and 3, 4 days after vaccination. We have repeatedly observed that the inflammation of the cloaca sub-

sides very rapidly so that the mucosa is practically normal in about a week. In other words, the disease process in the cloaca does not differ materially from that which involves the respiratory tract. This being the case, there is a possible explanation for the positive reading on 20 birds on May 2, and a doubtful reading on the same birds on the following day. That is to say, the second reading was made just at a time when the inflammation was subsiding.

Thus, a positive reaction was recorded for 57 birds on one reading or the other. In all probability the 19 birds, whose reactions were recorded as doubtful by both of us, were actually negative. At any rate, 4 birds (28, 47, 54 and 76) contracted laryngotracheitis and died on May 10, and all four belonged to the group of 19 just mentioned. It is presumed that these birds are the ones noted to be affected after vaccination. Certainly no more than four cases ever were observed at one time. Otherwise, the flock enjoyed good health.

It was originally planned to test the immunity of these birds by intratracheal inoculation at intervals during this winter in order to determine the duration of immunity. It will be recalled that in previous experiments every bird vaccinated (except Y 277 in experiment 1) showed a take, whereas, in the present experiment, infection of the cloaca probably failed in the case of 19 birds. Bird Y 277 died from exposure to infection eliminated from the artificially produced cases in that experiment. In experiment 4, however, we had not introduced artificially infected birds nor were the vaccinated birds inoculated in the trachea, but as might be expected the disease in the cloaca furnishes an abundance of virus. Hence, although this population was not intentionally exposed to infection, it was nevertheless subjected to it. The experiment emphasizes the importance of securing 100 per cent of takes at the time of vaccination, otherwise those which fail to become successfully vaccinated are exposed to infection eliminated by those which are vaccinated.

There appears to be at least one explanation for failure to get 100 per cent of takes in this experiment, that is, the use of 2 mg of virus per cc of diluent as compared to 4 mg as in previous experiments. In swabbing the cloaca it is possible also that not enough friction was applied.

Experiment 9: The purpose of this experiment was the same as that of experiment 4, except that the birds were vaccinated at the same time with a pigeon-pox virus. In this lot there were 235 Rhode Island Reds of February 11 hatch confined in three

colony-houses. The vaccine was prepared from the four birds which died April 15-17 in experiment 2, and was used at the rate of 2 mg per cc of diluent. Vaccination was done on May 5. Cloacal examinations made on birds caught at random, three or four days after vaccination, indicated that a low percentage of takes could be expected. Consequently, it was decided to re-vaccinate every bird on May 11, at which time a reading was recorded for each individual. The results showed 172 negatives, 30 doubtfuls and 33 positives. Revaccination was done with virus from the 4 birds which died on May 10 in experiment 4, and was used at the rate of 4 mg per cc of diluent.

The second reading was made May 16, by the same observer, without reference to the first reading. The results of the two readings are recorded in table IV.

TABLE IV—*Results of readings after first and second vaccinations on 235 birds.*

READING ON MAY 11, AFTER 1ST VACCINATION	BIRDS	READING ON MAY 16, AFTER 2ND VACCINATION	BIRDS
Negative	172	Positive Doubtful Negative	152 11 9
Doubtful	30	Positive Doubtful Negative	27 1 2
Positive	33	Positive Doubtful Negative	4 2 27
Total	235		235

The results of the two readings are interesting when considered in relation to each other. From the high percentage of negative reactions following the first vaccination it is fairly certain that the dose of vaccine was not sufficiently large and, by the same token, the high percentage of positive reactions after the second vaccination would indicate that in this case the dose was adequate. There may be two reasons for this, namely, the first vaccine was about 20 days old and was used at the rate of 2 mg per cc, whereas the second vaccine was only a day old, and contained 4 mg of virus per cc of diluent. Now, since the dose on second vaccination may be considered adequate, a high percentage of positive reactions would be expected in the birds which reacted negatively to the first vaccination. Thus, of the 172 which

did not react to the first vaccination, 152 were positive after the second vaccination, 11 were doubtful, and only 9 negative. For the same reason, those which reacted positively to the first vaccination should be immune to the second. The results show that on second vaccination the 33 positive birds gave 27 negative reactions, 2 doubtful and 4 positive. Considering the 30 birds giving doubtful reactions on first vaccination, we find that 27 were susceptible, one was doubtful and two were immune to the second vaccination. From this it might be concluded that the majority of reactions recorded as doubtful after the first vaccination were in reality negative.

When the first reading was made, the leg also was examined in order to determine whether the pigeon-pox vaccination took or not. In three cases there was no swelling of the follicles and in three cases the reaction was doubtful.

As in the case of experiment 4, it was only natural to expect cases of bronchitis in view of the large number of negative reactions following the first vaccination. However, the number was not large and an accurate record was made only of those cases seen when every bird was handled on May 11 and 16. Thus, eye lesions were found in birds 927, 975, 1165 and 1190, all of which reacted negatively to the first vaccination and positively to the second. The total mortality from all causes is listed in table V.

At least four of these losses were avoidable. Through a misunderstanding with the caretaker, the birds were crated (25 to

TABLE V—Mortality after vaccination of a flock of 235 birds.

BIRD	REACTION		DATE OF DEATH	CAUSE OF DEATH
	MAY 11	MAY 16		
918	—	+	5-16-32	Suffocated in crate
977	—	—	5-16-32	Laryngotracheitis
905	—	+	5-17-32	Laryngotracheitis
940	—	+	5-17-32	"Pickout"
981	—	+	5-17-32	Internal hemorrhage
1102	±	+	5-17-32	Laryngotracheitis
1199	—	+	5-17-32	Internal hemorrhage
999	±	+	5-18-32	Broken wing, blood in crop
1098	—	+	5-18-32	Laryngotracheitis
944	±	+	5-18-32	Laryngotracheitis
1106	—	+	5-25-32	Fowl paralysis
1168	—	+	5-31-32	Fowl paralysis
1146	—	+	6-2-32	Fowl paralysis

+ = positive reaction; ± = doubtful reaction; — = negative reaction.

a crate) and held in the houses about an hour longer than was intended. Practically every bird developed a watery diarrhea and gasping in consequence of the holding and temperature. These symptoms disappeared by the following day.

VACCINATION OF CHICKS

Experiment 6: The appearance of bronchitis in young chicks on some farms would make vaccination at an early age desirable. In order to investigate the possibility of doing this, 25 Single Comb White Leghorn chicks, hatched April 26, were vaccinated on April 29 with a vaccine prepared from the virus of birds dying in experiment 2. The vaccine contained 2 mg of virus per cc. The chicks were kept in a battery and, when examined on May 3, only nine were considered as positive. There were no visible effects of the vaccination and no cases of laryngotracheitis.

Experiment 12: Thirty cross-bred chicks, hatched May 23, were vaccinated May 25. The vaccine contained 4 mg of virus per cc, which was collected between March 9 and 12, that is, the same as that used in experiment 2. A reading made May 30 showed 21 positive and 9 negative reactions. As in the following experiment these chicks developed a peculiar disease of the peri-orbital tissues which became swollen and blackened. We have not observed these symptoms in laryngotracheitis before and cannot say that they are ever associated with this disease. Some of the chicks died, but an accurate record was not kept.

Experiment 11: On May 20, 115 day-old S. C. White Leghorn chicks were vaccinated and placed in a battery. The virus was gathered from birds dead in experiment 9 and was used at the rate of 4 mg per cc. Each chick was examined on May 25, with the result that 74 were recorded as definitely positive and were placed by themselves in one section of the battery. Of those remaining, 14 were recorded as doubtfully positive and 27 as definitely negative, and all of them were revaccinated with the virus used in experiment 2. An examination the following day justified the reading of 14 chicks as definitely positive and these were united with the 74 chicks already separated. A rereading on May 30, of the 27 negative chicks which were revaccinated on May 25, showed that 16 were positive and 11 negative. The 88 definitely positive chicks already separated were also re-examined at this time and 27 of them showed a necrotic patch in the cloaca, and diarrhea. The mortality recorded was as follows: May 29, 2; May 30, 3; June 3, 3; June 4, 3. On post-mortem examination the cloaca showed necrotic tissue. After June 4 others died and the same condition of the eye developed

as reported in experiment 12. The results in this and the experiment above were sufficiently disastrous to indicate that vaccination at this age is too hazardous.

Experiment 13: Successful infection of the cloaca, and therefore immunization, probably depends upon many factors, one of which is the mode of applying the virus. As already suggested, one reason for the low percentage of takes in experiment 4 may have been due to insufficient friction in swabbing the cloaca. In order to facilitate abrasion of the mucosa a vaccine containing equal parts by weight of finely ground sand and virus was prepared. Another was prepared in the same manner except that kieselguhr was used instead of sand. The results were controlled by a third vaccine containing no abrasive substance. In each case the same virus (Ramsberg strain) was used but because of the large amount needed the different samples used in making the vaccine varied in age. The vaccine contained 25 mg of virus per cc of diluent, and vaccination was done on May 27. Pen 1 was vaccinated with the sand and virus mixture and pen 2 with the kieselguhr and virus mixture. These birds were about 4 weeks old and were S. C. White Leghorns, with the exception of 17 Rhode Island Reds. A reading of the pullets in these pens was made on June 1 and the cockerels were separated to make up pen 3, which was not read until June 2. Pens 4 and 5 were vaccinated on May 27 with vaccine which did not contain inert material. The birds in these pens were somewhat younger. A reading was made on them June 2. The results of the reading are recorded in table VI.

The results would seem to indicate that the addition of an abrasive substance to the vaccine facilitates infection, and of the two agents used, kieselguhr showed a slight advantage.

At the time of reading, note was made of the incidence of

TABLE VI—*Effect of the addition of an abrasive substance to a vaccine.*

PEN	KIND OF VACCINE	BIRDS	POSITIVE		NEGATIVE	
			No.	%	No.	%
1	Sand and virus	104 pullets	31	29.8	73	70.2
2	Kieselguhr and virus	118 pullets	48	40.7	70	59.3
3	Vaccines 1 and 2	188 cockerels from pens 1 and 2	59	31.4	129	68.6
4	Virus	220 cockerels and pullets	35	15.9	185	84.1
5	Virus	387 cockerels and pullets	56	14.5	331	85.5

bronchitis in the various pens with the following results: In pen 1, two birds showed eye lesions, one showed cloacal infection and the other did not. No infection was recorded in pen 2. In pens 3 and 4, three birds in each showed eye lesions and did not show infection of the cloaca. In pen 5, twelve birds with eye lesions were recorded. Of these, three showed infection in the cloaca and nine did not.

We do not have an accurate record of the mortality in this lot of 1,017 birds, but it is known that this was not higher than might be expected under the circumstances. It was an ordinary flock reared in confinement and was infected with coccidiosis at the time of vaccination. When readings were made 5 and 6 days respectively after vaccination, the flock, with the exception of the cases already recorded, showed no ill effects of the operation.

Experiment 14: Other factors which probably influence infection of the cloaca are virulence and dose of virus, or perhaps more properly speaking, dose alone. At any rate, in order to determine differences in the virulence of virus from different individuals, each of 12 birds was inoculated intratracheally on September 8, with 1 cc of a concentrated suspension of virus collected between March 9 and 12. All birds developed symptoms in the usual time, but these were very mild except in three birds which died on September 11, 12 and 13, respectively. The virus from the first two birds was combined as vaccine 0 and dried in an incubator. Six of the remaining birds were killed on September 13 and the virus from each dried separately to make vaccines 1, 2, 4, 5, 6 and 7. Vaccine 3 was prepared from the bird which died on September 13. Vaccines 3 and 7 were dried in an incubator, and the remaining lots in a desiccator through which heated air was passed. No record was made of the temperature, which undoubtedly varied somewhat with the different lots. At any rate, a rough titration was made on September 15. From each lot three dilutions of vaccine were made, that is, at the rate of 20, 10 and 5 mg of virus per cc of diluent. Of the first two dilutions, only 0.5 cc of vaccine was prepared, whereas 1 cc was prepared with 5 mg of virus. In applying the vaccine a different swab was used for each dilution of each lot, and applications were continued until the quantity was exhausted. Since it is impossible to graduate the dose by the method of administration used, the number of birds vaccinated from a given quantity varied. The birds used in the titration were from four hatches between May 30 and June 21 and therefore approximately three months old. A reading was made on September 20 without ref-

erence to virus or dilution used. The results on the 855 birds used are recorded in table VII.

An examination of table VII shows that in general the percentage of positive reactions decreased as the virus dilution

TABLE VII—Results of titrations on eight vaccines.

VACCINE	VACCINE (cc)	MG OF VIRUS PER CC	INOCULATED	POSITIVE (%)	DOUBTFUL (%)	NEGATIVE (%)
0	0.5	20	26	69.23	15.38	15.38
	0.5	10	21	57.14	23.80	19.04
	1.0	5	57	19.29	8.77	71.92
1	0.5	20	29	86.20	3.44	10.34
	0.5	10	23	82.60	4.34	13.04
	1.0	5	32	62.50	3.12	34.37
2	0.5	20	21	47.61	19.04	33.33
	0.5	10	32	15.62	6.25	78.12
	1.0	5	35	17.14	14.28	68.57
3	0.5	20	42	64.28	16.66	19.04
	0.5	10	23	73.48	13.04	13.04
	1.0	5	44	56.81	25.00	18.18
4	0.5	20	50	26.00	14.00	60.00
	0.5	10	26	30.76	7.69	61.53
	1.0	5	71	32.39	7.04	60.56
5	0.5	20	39	61.53	15.38	23.07
	0.5	10	20	25.00	15.00	60.00
	1.0	5	25	68.00	0.00	32.00
6	0.5	20	28	50.00	3.57	46.42
	0.5	10	24	54.16	4.16	41.61
	1.0	5	51	39.21	19.60	41.17
7	0.5	20	34	94.11	2.94	2.94
	0.5	10	40	90.00	2.50	7.50
	1.0	5	62	79.03	4.83	16.12
Total			855			
Average				52.51	10.40	37.07

increased. It is necessary, of course, to make allowance for the number of birds vaccinated from a given quantity inasmuch as this influences the dose. Thus, approximately the same number of birds were vaccinated with 0.5 cc of the first two dilutions of vaccine 0, and about twice as many birds were vaccinated with 1.0 cc of the third dilution. Correspondingly, there is a decrease

in the percentage of positive reactions as the virus dilution increased. On the other hand, in the case of vaccines 4 and 5, for example, the highest dilution actually gave a higher percentage of takes than the lowest. But, in these cases the discrepancy can at least be partly accounted for when the number of birds vaccinated per given volume of vaccine is taken into consideration. In the case of vaccine 4, 50 birds were vaccinated with 0.5 cc of the first dilution and 71 birds with 1.0 cc of the third dilution, and in the case of vaccine 5, 39 birds were vaccinated with 0.5 cc of the first dilution and only 25 vaccinated with 1.0 cc of the third dilution. In spite of these allowances, the percentage of takes is not in direct relation to the dose.

Further examination of the table shows that vaccine 7 gave the highest percentage of takes. We have no explanation for this except that, as in the case of vaccine 0 and 3, drying was effected in the incubator in which case overheating could not have occurred. Vaccine 7 differed from vaccines 0 and 3, however, by having been harvested from a killed rather than a dead bird. Some of the samples dried in the desiccator probably were overheated. The mortality due to laryngotracheitis in this lot of 855 birds was 6. The first loss occurred on September 21 and the last on October 21. Of these, four were recorded as negative and two as doubtful when read on September 20.

Experiment 15: At least one other factor, that of age of birds, influences the percentage of takes on vaccination. This was brought out in the present experiment, in which four of the vaccines employed in the above experiment were used on birds six months old. The flock was vaccinated on September 21 and a reading was made on the 26th. The results are recorded in table VIII.

When these results are compared with those reported in the previous experiment, it is observed that a lower percentage of takes was had in the older birds. Thus, in the previous experiment, 0.5 cc of vaccine 0, containing 5 mg of virus and used on

TABLE VIII—Results of vaccinating birds six months old.

VACCINE	VOLUME (CC) OF VACCINE	VIRUS IN VACCINE (MG)	BIRDS	POSITIVE (%)	DOUBTFUL (%)	NEGATIVE (%)
0	4	40	202	8.91	22.77	68.31
3	4	20	144	24.30	22.91	52.77
6	1	28	43	27.90	20.93	51.16
7	3	20	81	20.98	13.58	65.43

21 birds, gave 57.14 per cent positive reactions, whereas in the present experiment 4 cc of this vaccine, containing 40 mg of virus and used on 202 birds, gave only 8.91 per cent positive reactions. The results also are inconsistent in that vaccine 7 should have given the highest percentage of takes but it did not. It should be added that this flock of 498 birds produced 272 eggs the day before vaccination. The day before reading, production was 292 eggs and in the following days rose to 307. Since the percentage of takes was low, it was only natural to expect laryngotracheitis in the flock. Consequently, 22 birds with a slight swelling of the sinus were recorded on September 26, when the reading was made, but curiously enough these were confined almost entirely to two compartments, that is, in the birds which gave 8.91 per cent positive cloacal infection. At this time, it was learned that bronchitis had existed in other lots of birds on the farm for some weeks, therefore, it is likely that at least one compartment of vaccinated birds was already exposed, since they were the last to have been brought in from a range adjoining that containing infected birds.

As evidence that the vaccines had not decreased in potency, all of them, except 7, were mixed and used at the rate of 28 mg per cc on October 9, on a flock of birds about four and one-half months old. Sixteen cc of vaccine was used on the 764 birds in this flock by a practicing veterinarian, with the result that on the fifth day a take was recorded in about 90 per cent of the flock. The total loss from all causes was 10 birds.

Experiment 16: We have already established that among survivors of an outbreak of laryngotracheitis certain birds continue to carry the virus in the respiratory tract.⁴ It was therefore important to determine whether or not the virus was carried in the cloaca after immunization. Accordingly a separate swab was introduced into the cloaca and bursa of each of 30 birds which had been vaccinated three weeks before. These birds, with the exception of one in experiment 9, were in experiment 4. The 30 swabs were divided into 10 lots of three each, so that 4 lots were from birds in which successful infection of the cloaca had been effected in every case. In each of 3 lots, two of the birds from which the swabs were made were positive and one was doubtful. The next two lots were the reverse of the above (1 positive and 2 doubtful) and each swab in the final lot was from a bird on which the reading was recorded as doubtful. Thus, 10 emulsions were made of the swabs and each emulsion inoculated intranasally and intratracheally into a susceptible bird.

None of the 10 birds thus inoculated became affected with laryngotracheitis.

DISCUSSION

From the results reported in experiments 1, 2 and 3, there can be no doubt that immunization by the cloacal method results in an immunity sufficient to protect against contact infection (experiment 1) as well as against artificial inoculation (experiments 2 and 3). Fifty-eight birds were swabbed in the cloaca in these three experiments and 57 showed infection of this part. The one bird which failed to become infected took the disease later and died. In the same experiments 42 susceptible birds were used, of which 41 definitely took the disease and 11 died. The virus used in preparing the vaccines in these experiments had been held from 20 to 59 days and was used at the rate of 4 mg per cc of diluent. The one failure to get a take was in experiment 1, in which the oldest virus was used and, of the three groups of birds, this one was the oldest. Finally, the virus was produced during the colder months.

In experiment 4, the vaccine contained only 2 mg of virus per cc of diluent. Part of the virus was 48 days old and a part was only 11 days old, but this latter part was collected during warmer weather, which we think may have some influence on potency. At any rate, the percentage of takes was reduced and four birds died of laryngotracheitis as a result of infection eliminated by vaccinated birds. The experiment emphasizes the importance of securing takes in all vaccinated birds. Otherwise the successfully vaccinated ones serve as a source of infection for those not successfully vaccinated. The results of experiment 9 parallel those of experiment 4. Here again the first vaccination was done with a vaccine containing only 2 mg of virus per cc. Upon revaccination, using 4 mg of a fresh virus per cc, the percentage of takes was materially increased. This experiment shows also that it is possible to vaccinate at the same time with a pigeon-pox virus.

From what has been said, it is apparent that the percentage of takes depends upon the dose of virus. Unfortunately, there is no method of determining dosage except by actual titration. The concentration of virus in a given weight of dried exudate is probably influenced by (a) the time of collection in the course of the disease, and perhaps season, (b) the conditions under which it is dried and (c) the length of time and conditions under which it is held before application. Further, a dose suitable for fowls of a given weight might be inadequate for larger birds.

Successful infection of the cloaca seems to depend upon some degree of abrasion of the mucosa. Although definite experimental evidence to support these possibilities is lacking, the results here reported are highly suggestive. The virus used in experiment 14, for example, was produced during hot weather and although it was used after being held for only two days, it failed to produce a high percentage of takes in some cases even in relatively large doses (20 mg per cc). In the same experiment there was evidence suggesting that the mode of drying affected the potency. Different samples of virus used in this experiment on birds approximately three months old did not give so high a percentage of takes when used on older birds. There was some evidence in the results of experiment 13 to indicate that the addition of an abradant facilitates infection of the cloacal mucosa. The results of attempts to vaccinate young chicks (experiments 6, 11 and 12) were such as to indicate that this practice is too hazardous. Also, the results of experiment 15 involving older birds indicate that vaccination should be done at an earlier age or that a more potent virus is required. It would appear that birds 2 to 3 months old are best suited to this method of immunization.

Immunity seems to develop rapidly, at least, birds resist artificial infection of the trachea nine days after inoculation of the cloaca. Nothing can be said regarding the duration of immunity but there is no reason why it should not be as lasting as that induced by the natural disease, that is, throughout the life of the bird. Finally, attention is called to the fact that in this method of immunization an infection in a part of the digestive tract results in an immunity of the respiratory tract.

SUMMARY

Swabbing of the cloacal mucosa or that of the bursa of Fabricius with a virus suspension results in an infection of these parts. The disease process runs its course in about one week, after which the cloaca as well as the respiratory tract is immunized against the disease. Successful infection of the cloaca probably depends upon the dose of virus.

It is important to induce cloacal infection in every bird, otherwise the ones not so infected are exposed to the infection eliminated by those successfully vaccinated. If cloacal infection is induced in every bird there is no loss attending immunization, otherwise the losses are almost entirely confined to the birds in which cloacal infection was not successful. In any event the loss has never been unusual. Vaccination of young chicks was not

satisfactory and in birds six months old the percentage of takes was not large enough, although a larger dose of virus may compensate to some extent. The most desirable age for vaccination seems to be between two and three months. Infection of the cloaca may be facilitated by rotating the swab on the mucosa or by the addition of an inert abrasive substance. Limited observations seem to indicate that vaccinated birds do not continue to carry the virus in the cloaca.

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PRESIDENT MALCOLM: Gentlemen, if there is no discussion, we will proceed to the next paper, "Types of Leg Disorders Affecting Growing Chicks," by Dr. R. M. Bethke, Ohio Experiment Station, Wooster, Ohio.

DR. R. M. BETHKE: Before I start reading my paper I should like to make this confession, to the effect that I am not a poultry pathologist. I am merely interested in the nutritional side, or specifically my classification is that of a biological chemist, and I am more or less considered a fowl doctor, spelled with a "w" rather than a "u." (Laughter)

. . . Dr. Bethke then read his paper . . .

TYPES OF LEG DISORDERS AFFECTING GROWING CHICKS

By R. M. BETHKE, *Wooster, Ohio*
Ohio Experiment Station

The introduction of "mass production" procedures into poultry keeping has carried in its wake many perplexing disease problems. Not only are the problems of transmissible diseases and parasitism more difficult to reckon with, but the problems of nutrition and nutritional disorders also have taxed the ingenuity and better judgment of the profession. It has been aptly said that the moment we commit any violations against the biologic laws of nature, there will be something doing. That there is "something doing" in the poultry industry is well realized and understood by all who are directly or indirectly associated with the industry.

The violation of certain of nature's laws has brought to our attention certain types of leg disorders, which I propose to discuss briefly. I shall not attempt to cover all the possible causes

of "birds going down on their legs" that are known to the poultry pathologists. My efforts will be restricted primarily to a discussion of the types of leg disorders of chicks as a result of faulty nutrition.

There are, in general, four different leg disorders that affect growing chicks. These are (1) rickets, or true leg-weakness; (2) slipped tendon, hock disease, or perosis; (3) crazy chicks and (4) nutritional paralysis. I will discuss each type separately, with respect to cause, occurrence, symptoms and prevention, as far as these are known.

1. *Rickets, or true leg-weakness:* This disease is caused by a deficiency of either vitamin D or calcium and phosphorus or both. It seldom if ever occurs before the fourth week, under ordinary conditions, unless the feed in question is decidedly deficient in calcium or phosphorus. The first symptoms usually noted are frequent squatting of the birds and disinclination to walk. The feathers become ruffled and the birds become unthrifty in appearance. The bones, due to improper calcification, are low in ash content and frequently become enlarged and bent. The disorder, as is well known, can be corrected or prevented by supplying vitamin D in some form, and adjusting the calcium and phosphorus content of the ration.

2. *Hock disease:* This disorder is very commonly confused with rickets or true leg-weakness. It makes its appearance usually after the third or fourth week. The legs of the birds become bowed or one or both legs will be badly twisted, or distorted as a result of the slipping of the Achilles tendon from its normal position. Usually the bowing or distortion of one or both legs is accompanied by an enlargement and flattening of the hock joint. The bones are well calcified and are normal in ash content in comparison to a low-ash bone in the case of rickets.

It has been observed that the birds of the heavy breeds are more susceptible to this disorder than birds of the light or Mediterranean breeds. Frequently it is also noted that a larger percentage of the males than the females are affected. The condition, to a certain extent, is associated also with rapid growth. However, it does not make its appearance in slow or poorly growing individuals. The types of floors on which the birds are brooded also appear to be contributing factors. Wire floors, or battery brooder conditions are more conducive to its development than solid floors or outdoor range.

The exact or specific cause of the condition is not definitely known. However, there is considerable evidence that excessive amounts of calcium and phosphorus—particularly phosphorus—

are incriminating factors. The matter of prevention lies in the proper control of the mineral content of the ration, and the adjustment of the protein content of the ration, so as to reduce the rate of growth. There also is some work which indicates that ground oats and rice bran exert beneficial effects in preventing the trouble.

3. *Crazy chicks*: The cause of this type of disorder is not known. Some investigators have advanced the theory that it is due to some toxic principle in cod-liver oil and that it could be controlled by the elimination of the oil from the ration. The writer is not in accord with this theory, for the reason that he has seen the condition in birds that did not receive cod-liver oil. As a rule, the disorder makes its appearance under intensive feeding conditions, especially in case of feeds which induce very rapid growth. It commonly occurs between the second and fourth weeks and rarely if ever after that time. A small or a considerable percentage of the birds may be affected.

The symptoms are of the nature of a vitamin-B or antineuritic deficiency. The birds not only lose their balance but also their sense of direction, and the proper use of their legs. The afflicted individuals frequently lie on their side or sit on their hocks with a twisting or retraction of the head.

Under ordinary conditions, it is difficult to cure the disorder, although one investigator reported that yeast was effective if the bird was treated during the early stages. The condition, as a rule, can be controlled in a flock by checking feed consumption and rate of growth, by a radical change in feed or by adding ground corn, wheat bran, or alfalfa meal, to the ration in use for one or two weeks.

4. *Nutritional paralysis*: This condition in all probability is associated with a deficiency of the vitamin-G complex. It usually make its appearance after the third week, and is frequently confused with rickets or slipped tendon.

The affected birds can use their legs only with great difficulty and generally walk upon their hocks. Their toes curl inwardly and frequently the birds walk upon the distal end of the tarso-metatarsus. In advanced cases the birds lie upon the floor with legs extended in opposite directions. The leg muscles are flabby and without tone. In some cases the skin of the legs and toes of the affected chicks is dry and rough. It is distinguished from slipped tendon, or hock disease, in that no enlargement or flattening of the hock joint, bowing of the legs, or a displacement of the Achilles tendon is noted. It is distinct from rickets, for

additional vitamin D or minerals will not prevent or correct the condition. The bones of the affected birds are normally calcified in contrast to improperly mineralized bones in case of rickets. A certain percentage of the paralyzed chicks gradually recover without treatment and cannot be distinguished from the non-afflicted individuals, except that in some cases the toes will remain curled.

The prevention of the disorder from the practical standpoint lies in the liberal use of milk products in the ration. Green feeds, such as good quality legume meals, are also effective but not so efficient as milk. The most potent sources of the paralysis-preventing factor are beef and pork liver and yeast.

Although the symptoms and apparent causes of the four types of leg disorders are quite distinct, the matter of correct diagnosis is frequently difficult, for the reason that the pathological or histological changes of the disorders, except rickets, have not been worked out in detail. Correct diagnosis is further complicated by the fact that two of the disorders, for example, nutritional paralysis and slipped tendon, might occur in the same flock or pen simultaneously. It is only through careful study of the nutritional history of the birds and their behavior that a correct solution of the problem can be arrived at.

ADDENDUM

Fowl paralysis: I wish to say just one word with respect to fowl paralysis. It is generally considered that this condition does not show up until after the tenth or twelfth week. During the past year I have had occasion to see the condition at as early as five weeks, at least the condition that was diagnosed as fowl paralysis by the poultry pathologist. We were guilty of confusing that condition, inasmuch as it occurred at five weeks, with leg-weakness. Some of these birds were more or less unsteady on their legs. We first thought we were dealing with a mild case of rickets.

Again, we had some poultry experts there, and they were rather of the opinion that it was a mild case of slipped tendon or perosis, until the poultry pathologist, upon due examination, established that it was fowl paralysis. Apparently we can have fowl paralysis as early as the fifth week. In the question of diagnosis we must take that into consideration in attempting to distinguish it from these different types of nutritional disorders. (Applause)

PRESIDENT MALCOLM: The next item is "The Character and Extent of Poultry Diseases as Evidenced by Data Obtained in Government In-

spection Work," by Dr. L. D. Ives, Bureau of Agricultural Economics, New York, N. Y., and will be read by Dr. C. E. Edmunds. (Applause)
... Dr. Edmunds read the paper. ...

THE CHARACTER AND EXTENT OF POULTRY DISEASES AS EVIDENCED BY DATA OBTAINED IN GOVERNMENT INSPECTION WORK

*By L. D. IVES, New York, N. Y.
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The Bureau of Agricultural Economics of the United States Department of Agriculture is conducting two types of poultry inspection services at the present time. The first consists of the inspection of all live poultry unloaded for sale in New York City; the second, of the inspection of the dressed poultry used in canning-plants putting up poultry food products or in plants preparing full-drawn poultry for sale. As far as the Department is concerned, neither of these types of inspection is compulsory but is rendered by the Department only upon request of interested firms or organizations. This work is carried on under authority conferred on the Secretary of Agriculture by the Agricultural Appropriation Act, which authorizes him to investigate and certify the grade, quality and/or condition of poultry when offered for interstate shipment or when received at such important central markets as the Secretary may from time to time designate. Since no specific appropriations are provided for carrying on this work, applicants for the service are required to bear its full costs.

LIVE POULTRY INSPECTION

The inspection of all live poultry unloaded for sale in New York City by some suitable agency is required by regulation of the New York City Department of Health. The purpose of this inspection is to prevent the unloading and sale of overcropped poultry, that is, poultry with an undue amount of feed in the crop, and also to prevent the sale of diseased poultry unfit for food. The poultry industry of New York City represented by the New York Live Poultry Commission Merchants Association must be given due credit for bringing about the official inspection of poultry at that point, for although the City Department of Health regulation requires inspection, the Association was directly responsible for the passage of the regulations with the intention of correcting conditions existing in the sale of over-

cropped and diseased poultry. The inspection service carried on in New York City on live and dressed poultry costs the poultry industry about \$60,000 a year.

There was previously in existence a live poultry inspection service at New York sponsored by the industry itself. Owing to certain difficulties which arose, however, the Bureau of Agricultural Economics was requested to take over the inspection service. Accordingly, on November 15, 1926, the joint inspection service on live poultry started to function at New York through coöperation with the Bureau of Agricultural Economics and the New York Live Poultry Commission Merchants Association, and with the approval and active coöperation of the New York City Department of Health. The writer at that time was transferred from the meat inspection service of the Bureau of Animal Industry to the Bureau of Agricultural Economics to supervise the poultry inspection work at New York.

The live poultry inspection work at New York is carried on under the following conditions: At each railroad terminal there is stationed a veterinary inspector with such other veterinary or lay inspectors as may be necessary to handle the work at that point. When the man in charge of a car of live poultry advises the inspection service that the car is ready for unloading, the inspector enters the car and makes his examination. In the limited time available for inspection it is impossible to examine every bird in the car. The inspector's procedure is to handle a representative sample from the car to determine the average weight of crop. If this is in excess of two ounces the car is rejected for unloading and must be examined later before it can be unloaded. At the same time, the inspector separates out and destroys such birds as he observes to be diseased and unfit for food. Unloading of the car then can proceed, but the buyer of the poultry has the privilege of segregating any diseased poultry not observed and destroyed by the inspector on the original examination subject to later examination by the inspector. It is the data obtained from these inspections of cars of live poultry arriving in New York and from the inspection of dressed poultry in canning-establishments and dressing-plants later described which I shall report as indicating the extent and character of the poultry diseases found.

LIVE POULTRY RESEARCH RESULTS

Early in the live poultry inspection service, it was apparent that a laboratory was needed where inspectors could be trained in estimating the weight of crops in order to secure as accurate

and uniform judgment as possible, and where extensive study of the anatomy, physiology and diseases of the chicken, and of the natural digestive movements could be made. Consequently such a laboratory was set up and some research undertaken.

It was found that there is a certain definite rhythm of the movement of feed out of the crop, depending upon the kind of feed that the poultry had eaten. For example, cracked corn passes out of the crop at the rate of $\frac{1}{4}$ ounce per hour, corn and mash at the rate of $\frac{1}{2}$ ounce per hour, and soft mash at the rate of $\frac{1}{2}$ ounce per hour. This information has proved very valuable in determining the time when a car rejected for over-cropping might be expected to pass inspection on the second examination.

A good many tests of the blood and the contents of the alimentary tract by means of hydrogen-ion control have been made. It was thought that the feeding of large amounts of buttermilk, varying in acid content from 4 to 7 per cent, in the fattening stations and in the cars enroute predisposed the poultry to the pulmonary diseases, especially laryngotracheitis. The entire digestive tract was found to be uniformly acid in all birds arriving by freight, ranging from pH 6 in the crop to pH 3 in the gizzard. By neutralizing the digestive tract with soda in the drinking water, it was found that birds affected with laryngotracheitis immediately responded to a chlorazene and calcidin treatment. These results suggested that a lessening of the acid content of buttermilk at this time of year would be of great benefit to the shippers of poultry.

RESULTS OF LIVE POULTRY INSPECTION

During the six years in which the live poultry inspection service has been carried on in New York City, nearly 65,000 cars of live poultry from 30 states have been inspected. Of these cars 6,000 were rejected as containing poultry which was over-cropped or otherwise objectionable for unloading. Over 1,400 cars were found to contain poultry in an unsatisfactory condition of health on account of the evidence of infectious diseases being present. Such diseased cars were unloaded only under the direct supervision of a veterinary inspector and the cars themselves were placarded and ordered cleaned and disinfected under the supervision of a Bureau of Animal Industry inspector at regular cleaning stations. The inspectors rejected and caused to be destroyed from these cars containing sick poultry about 175,000 birds weighing 602,000 pounds. The principal causes of rejection were roup and infectious laryngotracheitis.

There were also rejected from cars other than those in which a general diseased condition existed nearly 200,000 birds weighing 620,000 pounds. The main causes of these rejections were emaciation, roup, dropsy, bruises, fractures, toxemia, and birds in moribund condition. Without inspection many of these diseased birds undoubtedly would have found their way into the retail stores of the city.

The live poultry inspected in New York City originated in 30 different states. The greater majority, however, come from Missouri, Indiana, Illinois, Nebraska and Tennessee. The greatest number of sick cars come from Nebraska, probably because of the greater distance traveled and the birds being longer in confinement.

Each year, about the latter part of August, infectious laryngotracheitis begins to show in the cars arriving at New York. This disease gradually increases in severity until January, when it begins to drop off very rapidly and practically disappears about March first and does not reappear until the following August. This year this disease is much more prevalent than usual, but less typical in character. Practically 100 per cent of the birds affected by this disease are young stock, the older birds apparently being immune.

Nearly all cars of live poultry arriving at this time of year show more or less of this disease. Car attendants often try to fool the inspector by killing off the visibly affected birds before requesting inspection, but the characteristic odor remaining in the cars tells the tale to the alert inspector.

As previously stated, all cars which contain birds with an infectious disease are placarded and sent to cleaning and disinfecting stations operated under the supervision of the Bureau of Animal Industry. While this measure is undoubtedly very helpful, it is not entirely sufficient. Every car which carries poultry should receive the same thorough cleaning before it is used again. The coops used in transferring to the slaughterhouse any poultry from cars in which infectious disease has been discovered are all marked for identification and are returned to the coop company plant where they are cleaned and immersed in tanks of boiling water.

DRESSED POULTRY INSPECTION

Dressed poultry inspection service is being carried on by the Bureau of Agricultural Economics at the present time in a group of plants in the northeastern section of the United States, through coöperation with the New York Live Poultry Commission Mer-

chants Association; with a group of plants in the Middle West, through coöperation with the National Poultry, Butter and Egg Association; with one plant in Minnesota, in coöperation with the Minnesota State Department of Agriculture, and in two plants in Washington State, in coöperation with the Washington State Department of Agriculture. The inspection of dressed poultry consists of the examination of every poultry carcass at time of evisceration by a qualified veterinary inspector.

RESULTS OF DRESSED POULTRY INSPECTION

In the earlier stages of this inspection service there was a tendency on the part of some of these plants to use low-grade poultry. As a result rejections were very heavy. In the later years the plants have used a better grade of poultry in which the rejections do not run so high. A large part of the poultry inspected in these plants consists of fowl and old cocks; to a lesser extent chickens of various sizes are used, and there has been a more limited quantity of other classes of poultry inspected.

In all nearly thirty million birds have been inspected in the various plants utilizing the dressed poultry inspection service, of which 950,000, or more than 3,000,000 pounds, have been rejected as unfit for food. Of the poultry rejected 65.5 per cent was tuberculous, 15 per cent was decomposed, 7 per cent had septicemia, $3\frac{1}{2}$ per cent was emaciated, 9 per cent was condemned for various other causes such as abscesses, tumors, peritonitis, leucemia, concretions, etc. In the birds found to be affected with tuberculosis, macroscopical lesions of the disease were found in 620,000 spleens as contrasted to 600,000 in the liver and 400,000 in the intestines. The lungs rarely show diagnostic lesions. Practically all of the tuberculous lesions are found in the older birds, particularly fowl over one year of age. In these fowl pullorum infection is uniformly present.

I do not have at hand detailed tabulations of the results of inspections for the year 1931, but I do have such details for the calendar year 1930. As of possible interest I therefore offer several tables.

A summary of the results of inspection for the calendar year 1930 serves well to bring out differences in the rejections in the different classes of poultry. It must be kept in mind that the different classes, as given in this summary, include all qualities of that class. The classes of mixed and miscellaneous, as given in this summary, represent heterogeneous lots of poultry usually of relatively low grade (table I).

TABLE I—*Summary of inspections for calendar year 1930.*

CLASSES	TOTAL POUNDS INSPECTED	TOTAL POUNDS REJECTED	PER CENT REJECTED
Fowl	7,108,881	300,230	4.2
Cocks	7,773,726	139,994	1.8
Cocks and fowl	2,898	96	3.3
Chickens	3,286,819	34,490	1.0
Mixed	4,099,330	498,684	12.2
Miscellaneous	299,746	24,460	8.2
Total	22,571,400	997,954	4.4

Table II shows percentage of rejections of No. 1 Fowl, No. 2 Fowl and No. 3 Fowl. Numbers 1, 2 and 3, as used in this table, represent a rough classification according to quality. All lots of mixed quality have been eliminated from the table. The various qualities of fowl reported in the table include fowl from numerous states. In table II the quantities of fowl inspected are summations of all inspections on single quality lots, there being no further weighting. As such the proportion of fowl in each of the three quality classifications may not represent fully the proportions as found in the states. Likewise the percentages rejected may not be fully representative.

TABLE II—*Percentage rejected, various grades of fowl, 1930.*

GRADE	TOTAL POUNDS INSPECTED	TOTAL POUNDS REJECTED	PER CENT REJECTED
No. 1	4,316,168	95,833	2.22
No. 2	2,033,421	110,073	5.4
No. 3	729,867	93,438	12.8

It is interesting to note that in the No. 1 fowl inspected the percentage rejected ran as follows for the different states where point of origin was known: Kansas, 0.8; Indiana, 2.1; Iowa, 2.9; Nebraska, 4.2; Minnesota, 3.7; South Dakota, 3.2; North Dakota, 4.2; Missouri, 1.3; Texas, 0.2; Illinois, 0.7; California, 1.1; Wisconsin, 3.2; Oklahoma, 0.3; Ohio, 1.0; Kentucky, 1.0.

It must be kept in mind, however, that the amounts of poultry inspected from these different states varied very greatly and that rejections include poultry thrown out for causes other than a diseased condition, such as decomposition. These comparative percentages, therefore, cannot be taken as accurate reflec-

tions of the quantitative occurrence of diseases in fowl in the states named. It will be observed, however, that the different percentages rejected are generally considerably higher in those states where avian tuberculosis is most prevalent.

A similar table is given with reference to the percentage rejections in the different grades of chickens inspected. In each instance the amounts involved are less, but in general the same comparisons prevail as in the case of fowl. Since very little tuberculosis was evident in the chickens, the differences in rejections from the different states of origin are much less, and therefore less significant (table III).

TABLE III—*Percentage rejected, various grades of chickens, 1930.*

GRADE	TOTAL POUNDS INSPECTED	TOTAL POUNDS REJECTED	PER CENT REJECTED
No. 1	1,755,061	4,913	0.3
No. 2	1,497,158	27,289	1.8
No. 3	34,196	2,284	6.7

There may be also some interest in rejections found in the limited quantities of other classes of poultry such as ducks, geese and turkeys. For example, out of 4,217 pounds of No. 1 ducks, no rejections were made. Similarly in 87 pounds of No. 1 geese inspected, there were no rejections. In 58,772 pounds of No. 1 turkeys, rejections amounted to 538 pounds (0.9 per cent). Out of 7,501 pounds of No. 2 turkeys, rejections amounted to 260 pounds (3.5 per cent). Out of 92,979 pounds of No. 3 turkeys, rejections amounted to 7,261 pounds (7.8 per cent).

It is our opinion that the live and dressed poultry inspection services carried on by the Bureau of Agricultural Economics have been of real benefit both to the poultry industry and to the consuming public. They have undoubtedly been the means of removing from consumption considerable poultry unfit for human food. They have also been the means of placing the live and canned poultry industries on a higher plane, and it would appear that this is recognized as beneficial to the industries concerned since the services continue to be used at a considerable cost to the industries themselves.

PRESIDENT MALCOLM: We will now listen to the report of the Committee on Transmissible Diseases of Poultry, by Dr. A. F. Schalk, Columbus, Ohio. (Applause)

. . . Dr. Schalk read the report. . . .

REPORT OF COMMITTEE ON TRANSMISSIBLE DISEASES OF POULTRY

DR. A. F. SCHALK, *Chairman*, Columbus, Ohio

Dr. Hubert Bunyea, Bethesda, Md.
Dr. Leo F. Rettger, New Haven,
Conn.

Dr. Lee M. Roderick, Fargo, N. Dak.
Dr. H. J. Stafseth, East Lansing,
Mich.

Dr. W. R. Hinshaw, Davis, Calif.

Your Committee on Transmissible Diseases of Poultry does not deem it advisable to lay a detailed formal report before this organization at this meeting. The personnel of the Committee is practically the same as that of the past couple of years, and anything that we may say would, in a large measure, be only a repetition of those reports. However, in order to refresh your memories as to the suggestions and recommendations incorporated in those reports, we will summarize them for your convenience and reconsideration:

1. That the federal and the various state regulatory forces continue with increased enthusiasm their splendid programs on avian tuberculosis among flock-owners where the disease is quite prevalent.

2. That the various research institutions of the country redouble their efforts and extend their research projects pertaining to the more economic problems relating to poultry hygiene and poultry diseases. We refer particularly to those concerned with fowl paralysis, laryngo-tracheitis, pullorum disease, leucosis, avian tuberculosis, fowl cholera and internal parasitism.

3. That veterinary practitioners manifest a more sympathetic interest in poultry problems, in order that they may render a more efficient service to the poultry industry, and incidentally obtain the confidence of flock-owners, by demonstrating their ability to cope with poultry hygiene and poultry disease problems.

4. That veterinary colleges enrich their curricula with more extensive courses in poultry hygiene and pathology. Also, supplement this with special short courses and conferences on poultry diseases for practicing veterinarians and all other veterinary agencies engaged in educational and regulatory work in poultry hygiene and pathology.

REPORT OF THE CONFERENCE OF OFFICIAL RESEARCH WORKERS IN ANIMAL DISEASES OF NORTH AMERICA ON STANDARD METHODS OF PULLORUM DISEASE IN BARNYARD FOWL

November 29, 1932

The following report is presented with the recommendation that, if adopted, it constitute the official methods of the Conference of Official Research Workers in Animal Diseases, upon the understanding that the Conference may at any time make alterations or additions as it deems necessary.

I. Diagnosis of the Disease in Young Chicks

The only criterion of infection with *Salmonella pullorum* shall be the isolation of this organism from the blood and body tissues of suspected chicks, and its complete identification.

POSTMORTEM EXAMINATION AND ISOLATION OF *SALMONELLA PULLORUM*

Chicks submitted for this purpose must be in a well-preserved condition. The stretched wings and feet are tacked to an operating-board and thoracic and abdominal organs brought to view by the usual dissection process. After careful observation of the internal organs, the surfaces of the liver, lungs and yolk-sac (when present) are seared with a hot blade, and one or two large (3-4mm.) loopfuls of tissue removed aseptically and streaked over the surface of nutrient agar medium, preferably slanted agar in test-tubes having a diameter of not less than $\frac{3}{4}$ inch. Two or three tubes are streaked in a series (dilution method).^{*} Complete examination should be made of at least three chicks.

Nutrient agar: The medium employed for such isolations shall be ordinary standard beef-infusion agar having a reaction of pH 6.8 to 7.2.

Incubation: This shall be for a period of from 24 to 48 hours at 37°C.

ISOLATION OF CHARACTERISTIC COLONIES AND IDENTIFICATION OF THE SPECIFIC ORGANISM

Colonies of *S. pullorum* on meat-infusion agar are recognized by their small dew-drop appearance and their tendency to remain discrete, even after continued incubation, thus resembling to a large extent colonies of streptococci.

Isolations are made from two or three of the characteristic colonies, on new slant agar, and the organism subjected to a thorough identification study, including microscopic examination of the unstained and Gram-stained slide mounts, cultural characteristics, fermentation properties in glucose, lactose, saccharose and dulcitol, and finally agglutination with known positive and negative blood sera whenever any doubt exists regarding the identity of the organism.

II. Serological Diagnosis of Pullorum Disease (Carrier Condition) in Maturing and in Adult Breeding Stock

Official method: The macroscopic tube agglutination shall constitute the official method.

Collection and delivery of blood samples: The blood samples shall be taken by properly qualified and authorized persons only, and in containers provided by the diagnostic laboratory or other authorized agent. The containers should be stout-walled test-tubes, preferably $\frac{3}{8}$ "x3", without lip, or small well-selected medicine vials, which have been thoroughly cleaned, and dried in a hot-air drying-oven. The tubes are accompanied by selected cork stoppers which, unless new, have been washed and thoroughly boiled or scalded, and dried. All birds must be officially leg-banded with bands supplied by the control agency.

The blood is procured by making a small incision in the large median wing vein, with a small sharp lancet, and allowing the blood to run into the tube, or by the use of a small syringe (with 20- or 21-gauge needle) which is properly cleansed between bleedings with physiological saline solution. From one and one-half to two cubic centimeters of blood should be collected. The tubes are corked and laid on their sides in order to allow the blood to solidify in a long slant. After the tubes have completely clotted, they are packed and shipped by mail (special delivery), rapid express or by messenger, to the laboratory.

^{*}In instances where chicks have been sent over long distances and are in a state of partial decomposition when they reach the laboratory, the brilliant-green, liver-infusion medium and method described by Mallmann and his associates may be employed to advantage. This procedure should be accompanied by the usual agar inoculation method.

All labelling must be clear and permanent, and may be done with a suitable pencil on etched portions of the tubes, or by means of fast-gum labels.

The blood samples must reach the laboratory in a fresh and unhemolyzed condition. Hemolyzed samples should be rejected. It is imperative, therefore, to cool the tubes immediately after slanting and clotting, and unless they reach the laboratory within a few hours, to pack them with ice in special containers, or by some other cooling system which will insure their preservation during transportation. In severe cold seasons, extreme precaution must be exercised to prevent freezing and consequent laking. The samples must be placed in cold (5 to 10°C.) storage immediately upon arrival at the laboratory.

Preparation of antigen: The antigen shall consist of three representative strains of *S. pullorum* which are of known, high agglutinability, but are not sensitive to negative and to non-specific sera. They are grown on agar having the following composition:

Water	1000 cc
Difco Beef Extract.....	4 gm (0.4 per cent)
Difco Bacto Peptone.....	10 gm (1.0 per cent)
Dry granular agar (Difco).....	20 gm (2.0 per cent)
Reaction—pH 6.8 to 7.2	

Large one-inch test-tubes, Kolle flasks or Blake bottles are streaked liberally over the entire agar surface with inoculum from 48-hour, *slant-agar cultures* prepared from the stock cultures of the selected strains.* Frequent resort to the stock cultures is highly desirable, in order to maintain the purity of the antigen, and to allow *long rest intervals for the organisms*. A second intermediate culture may be necessary at times to furnish luxuriant growths for the final transfers. The antigen-growing tubes or bottles are incubated 48 hours at 37°C., and the surface growth washed off with sufficient phenolized (0.5%) saline (0.85%) solution to make a heavy suspension or very light paste. The washings are filtered through lightly packed absorbent cotton placed in the apex of the funnel. The washings of the three separate strains are now combined in equal volume-density and stored in the refrigerator (5 to 10°C.) in tightly stoppered bottles.

The dilute antigen to be used in the routine testing is prepared from the stock antigen by dilution of the latter with physiological (0.85%) saline (C.P.)† solution containing 0.3 per cent phenol (Merck's blue or silver label brand), to a turbidity corresponding to 0.75-1.00 on the McFarland nephelometer scale. The H-ion concentration of the dilute antigen is corrected to pH 8.2 to 8.5 by the addition of dilute sodium hydroxid. In this narrow pH range thymol blue used as indicator (5 or 6 drops of the standard stock dilution added to from 5 to 6 cc of the diluted antigen in 5/8" test-tubes) imparts a dirty green to greenish blue color to the tube. Cresol red (7.2 to 8.8) also may be employed. The color reaction should be checked frequently by comparison with standard buffer solutions, with the use of the comparator block, or by the potentiometer method. New dilute antigen should be prepared each day and kept cold.

The diluted antigen is employed in 2-cc quantities in 4"x1½" test-tubes or 1-cc quantities in smaller tubes in which the final serum-antigen mixtures are made and incubated. The distribution of the antigen in the tubes may be accomplished by the use of long burettes, or special filling devices made for the purpose.

*The stock cultures are maintained by transferring to new sloped agar at least once a month, and keeping at 18 to 25°C. (average room temperature) in a dark closet or chest, following incubation for from 24 to 36 hours at 37°C. The purity of the stock cultures should be checked at definite intervals by microscopic examination of Gram-stained slides.

†The sodium chlorid should be of tested purity.

Serum dilutions, incubation, etc.: Either of two dilutions of the test sera may be employed, namely 1:25 or 1:50.* The 1:25 dilution, when used, shall serve as a finding dilution, and shall not be used to condemn a flock which has been placed on a free or accredited list, or the immediate progeny of an accredited flock, unless at autopsy the organism is found, or there is complete agglutination in dilutions of at least 1:50. In all official reports on the blood test the serum dilutions shall be indicated. The sera are introduced into the agglutination tubes in the desired amounts with well-cleaned serological pipettes or special serum-delivery devices which do not permit of the mixing of different sera.† The antigen and serum are well mixed before incubation.

Interpretation of results: The results shall be recorded as:

N, or —, when the tube remains uniformly turbid, and there is no distinct settling of antigen.

P, or +, when there is a distinct clumping of the antigen, and the liquid between and above the agglutinated particles is clear. The reaction should be full 4+.

S or ?, when the agglutination is only partial or incomplete (1+ to 3+). The reactions may be recorded as slightly suspicious, S or ?, or strongly suspicious, S or ?.

M, or missing, when samples listed on the original record sheet are missing.

H, or hemolyzed, when the blood samples were hemolyzed and unsatisfactory for the test.

B, or broken, when the sample tubes are broken on arrival, and no serum is obtained.

Some allowance must always be made for differences in the sensitivity of different antigens and different set-ups, and therefore, a certain amount of independent intelligent judgment must be exercised at all times. Also the histories of the flocks require consideration.

ADDENDA

Preparation of the nutrient agar for antigen production: Dissolve 20 grams of dry Difco agar in 1,000 cc of water by heating for 15 to 20 minutes in a pressure sterilizer at 15 pounds extra pressure. Add to the hot agar solution 4 grams of Difco meat extract and 10 grams of Difco Bacto Peptone. Test the reaction and adjust to as near pH 7.0 (6.8 to 7.2) as possible with dilute NaOH or HCl, as may be required. Heat for 10 to 15 minutes in the autoclave. Filter, if necessary, through absorbent cotton in funnel, and fill into large tubes, special flasks or bottles.‡ Sterilize by autoclaving for 20 to 25 minutes at 15 pounds extra pressure.§ If partly purified or refined agar (preferably granular) is employed, the hot liquid medium should filter readily through the cotton, and be ready for tubing. Clarification with egg white or whole egg is necessary only when a poor or crude grade of agar is used. Stock nutrient agar should be kept away from sunlight and dust, and in a cool place.

Ultimate eradication of pullorum disease should be the main goal, and every effort should be directed (1) to rid infected poultry flocks from pullorum carriers, and (2) to maintain free or accredited stock. It is

*There is much difference of opinion whether 1:25 or 1:50 should be the minimum dilution, and considerable research must be done before a final agreement can be reached.

†Where serological pipettes (graduated in 1/100 cc's) are employed, a separate pipette should be used for each serum. Care must be exercised at all times to prevent the laking of the red corpuscles with water.

‡If the ingredients dissolve completely and the reaction needs no adjustment, the second heating and the filtering may be omitted.

§When Blake bottles or Kolle flasks are used for growing the antigen, an additional heating for five minutes is desirable.

advisable to extend the privilege of retesting doubtful and occasional positive birds, and when necessary, of making postmortem examinations and cultural tests of the suspected birds, before such flocks are condemned and removed from the free or accredited lists.* All birds giving suspicious reactions should be removed immediately from the flocks, as well as the clearly positive reactors.

Finally, material departure from the methods and interpretations set forth in these recommendations should be stated clearly in official reports submitted by the laboratory to the control agency and to owners or managers of flocks under test.

DR. SCHALK: I move the adoption of the brief report as given, with the addition of the report on standard methods of diagnosis for pullorum disease.

DR. LEO F. RETTGER: I second the motion.

PRESIDENT MALCOLM: It has been moved and seconded that the report as read and the report from the Conference of Official Research Workers in Animal Diseases be adopted. What is your pleasure in the matter? All in favor of accepting the report will signify by saying "Aye"; contrary, "No." The "ayes" have it and the report is accepted.

We have with us at this time Dr. H. Preston Hoskins, Secretary of the A. V. M. A., who has something to bring before this Association. . . . Dr. Hoskins addressed the audience with reference to the disposal of the remainder of the book, "Livestock Sanitation," by the late Dr. Dalrymple. . . .

PRESIDENT MALCOLM: I have a request from the Special Committee on Agricultural Extension Service of the A. V. M. A. that they be allowed to present a question. If there is no objection I will ask Dr. H. E. Curry to handle the question.

. . . . Dr. Curry then read portions of the report of the A. V. M. A. Special Committee on Agricultural Extension Service that had been presented to the Shannon Congressional Committee. . . .

. . . . The session adjourned at 12:05 p. m. . . .

RECESS

FRIDAY AFTERNOON, DECEMBER 2, 1932

The sixth and final session convened at 1:30 p. m., President Malcolm presiding.

DR. N. F. WILLIAMS: Mr. President, at the hour of adjournment there was a matter before this body in the shape of a report of the Special Committee on Agricultural Extension Service of the A. V. M. A. I am going to make a motion that that report be received by this Association and referred to the Executive Committee.

DR. T. E. MUNCE: I second the motion.

PRESIDENT MALCOLM: It has been moved and seconded that the report be received and referred to the Executive Committee. All in favor of that will signify by saying "Aye"; contrary, "No." The "ayes" have it. The report is referred.

The next order of business will be a paper on "Field Observations of Erysipelas in Swine Herds," by Dr. C. F. Harrington, Pierre S. Dak.

. . . . Dr. Harrington read his paper. . . .

*The culture tests are made in essentially the same manner as described for chicks on page 1 of this report. Chief emphasis should be placed on pathological ovarian cysts and on cysts occurring in different parts of the peritoneal wall and organs. Also on pericardial exudates which at times accompany *Salmonella pullorum* infection in adult fowl. When more or less general infection is suspected in adult birds which come to autopsy, cultural tests should be made on the liver, lungs and heart-blood, as well.

FIELD OBSERVATIONS ON ERYSIPELAS IN SWINE HERDS

By C. F. HARRINGTON, *Pierre, South Dakota*
United States Bureau of Animal Industry

Swine erysipelas, caused by the organism *Erysipelothrix rhusiopathiae*, is classically defined and described in veterinary literature. Information relating to the disease has come, in much the greater part, from observations and studies of its occurrence as an acute septicemic infection among swine on the European continent. There the disease, in infected areas, is usually present in an enzootic form, not infrequently becoming epizootic, resulting in a high mortality among the swine of a given area, within a short period of time.

A disease, with the bacillus of swine erysipelas as the etiologic factor, has been noted among swine in the United States for a number of years, appearing as an urticaria. This form of erysipelas has proved to be of little economic consequence, rarely being clinically diagnosed but remaining for detection from the peculiarly diamond-shaped skin involvements seen on the surface of the skin of dressed carcasses, from which the name "diamond skin disease" is derived.

However, a number of sporadic occurrences of swine erysipelas of different type have been reported in recent years from widely separated parts of the United States. As reported, these cases have been in much detail quite similar to the acute or chronic systemic disease noted in the European outbreaks. It is the purpose, through this paper, to present certain observations made in our investigations of some of these cases, where swine erysipelas infection proved to be the disease factor. Our remarks will be directed toward a description of the disease as it confronts the live stock sanitary officer and the practitioner of veterinary medicine in the hog-producing belt of the mid-western states, as seen in South Dakota.

In the matter of the distribution of swine erysipelas in the United States, other than the more benign urticarial form (diamond skin disease), the federal Bureau of Animal Industry furnishes some interesting information. To date of March, 1932, over a period of the last several years, the Bureau lists the cases reported to its Pathological Division as follows:

In 1921, of the five cases reported to our Pathological Division, one came from Texas, three from Chicago, and one from Benning, D. C. These were skin lesions. In 1922, Doctor Ward reported 22 cases, joint lesions, of which 14 were from packing-houses, and

which he thought probably originated from a wide area in the United States; Doctor Giltner reported one acute case in a pig originating in Virginia. In 1924, Parker, Lockhart and Ray investigated 110 suspected cases of acute and chronic swine erysipelas encountered at slaughtering establishments in Kansas City. Sixteen of these cases showed the presence of the swine erysipelas organism in the various organs and tissues, and, as the studies covered a period of several months, it seems probable that some of these cases were from widely separated localities.

In 1931, Dr. Hadleigh Marsh reported having isolated the swine erysipelas organism from a number of cases of joints of lambs in the state of Montana. Three strains of the organisms isolated by Doctor Marsh were submitted to the Bureau for identification.

Our pathological laboratory has made definite diagnoses of acute swine erysipelas in a number of cases from locations, as follows: Topeka, Kansas (1929), 1 case; Indianapolis, Indiana (1930), 1 case; Omaha, Nebraska, 3 cases (1930, 1931, 1932, respectively); Platte, South Dakota, since February, 1931, 9 cases; Pierre, South Dakota (1931), 1 case. During the last six months cultures of the swine erysipelas organism have been received from laboratories located at Richmond, Va., Brookings, S. D., and Columbus, Ohio. The cultures were definitely identified as the *E. rhusiopathiae*.

Perhaps the first recognition of swine erysipelas as a herd disease of material economic consequence to the swine-producing belt of the United States may properly be attributed to the work of Dr. A. A. Fosterman, a practitioner of veterinary medicine located at Utica, South Dakota. The first contact had in commencement of the observations herein related was obtained through the coöperation and courtesy of Doctor Fosterman. The greater part of the recent reports and descriptions of the disease, as seen in our Corn Belt area, have come through association with Doctor Fosterman, and from data compiled in his practice.

Swine erysipelas as a herd disease, resulting in serious economic disturbances, was observed as early as 1927, on certain premises in the area of our investigations. In 1931, in reports of official field activities in South Dakota to the U. S. Bureau of Animal Industry, note was made of the occurrence of swine erysipelas. Early in the commencement of the calendar year 1932, plans were effected whereby a more comprehensive and complete study of field cases coming under our observation was obtainable. This became, in a measure, a necessity, because of the difficulty experienced in recognizing swine erysipelas as a disease entity in deference to the probable and actual presence of hog cholera.

During 1932, as a part of these plans, tissue and blood specimens in practically every case of suspected swine erysipelas brought to our attention have been submitted for laboratory study to the Pathological Division of our Bureau. Tissue specimens from the greater part of these same cases have been forwarded also to the Veterinary Department of the South Dakota

Agricultural College. Determination of the presence of *E. rhusiopathiae* as a pathogen was made through cultural and inoculation tests.

In dealing with the more recently observed cases, the laboratory of the Bureau at Ames, Iowa, has given attention to the determination of the presence or absence of hog cholera virus in materials collected, where swine erysipelas was diagnosed clinically. These cases for hog cholera virus determination have had to do more specifically with apparently pure erysipelas infection, at least with cases which clinically appear to be of such nature.

These details of arrangements, which have applied in the plans under which our observations were made, seem especially pertinent to an introduction of the more specific part of our remarks. By these acknowledgments, we indicate the exacting and favorable conditions that have made possible the specific determination, whether swine erysipelas actually existed. In addition, in our investigations of a number of outbreaks, the question of the possibility of the complication of hog cholera was answered. Thus a more highly specific diagnosis could be reached.

Since these plans became operative, 61 sets of tissue and blood specimens, or tissues alone, have been sent to the federal and state laboratories at Washington and Brookings. Not all these specimens were obtained from herds where swine erysipelas was suspected. Herds affected with disease that appeared to be on the border-line were selected at times for comparison. The findings of these two laboratories have been closely the same in the determination of swine erysipelas infection. We have also benefited through review of cases where tissue specimens were sent by veterinary practitioners to different laboratories, some times to a commercial laboratory and sometimes to either the laboratory at Washington or the laboratory at Brookings.

The area of these observations on swine erysipelas in South Dakota has been limited to that part of the State lying east of the Missouri River. In this area the disease has been found quite widely distributed in the form of an acute septicemic infection, though as yet apparently more of sporadic occurrence. It is quite evident to us that as more expert skill in the differential diagnosis of the disease obtains, an apparent increase in the number of cases occurring may be expected.

With the facilities available to us, swine erysipelas has been determined as a herd disease in a majority of the east-river counties of South Dakota. In some of these counties, those in which the greater part of our work centered, many herds have

been found infected, while in the others, where less work has been done, only a small number of cases have been reported. To date, the disease has been investigated by us on more than 100 farms in the State.

Wherever it has been possible, an attempt has been made to check the recurrence of the disease on known infected premises. Twenty-six farms where the disease has apparently appeared over a number of years have come under our observation. Though we admit the possible error in fixing the disease factor for past losses, by history or other related matter from owners of live stock, we are convinced that on at least three of the farms under observation, the disease has appeared among the spring and fall pigs over a period of four years. On two farms, a swine erysipelas-like disease may have been of recurrence, extending back for a ten-year period. The enzoötic character attributed to the infection under European conditions is evidenced by such recurrences within the area of our observations, which factor must be reckoned with in combating the disease.

During the spring of 1932, in certain localities under observation, the disease appeared in epizootic form, among sows heavy with pig or sows with litters, and among nursing pigs. This epizootic occurrence of the disease has been very marked in these instances. It is highly probable that similar occurrences may have been experienced in other areas where, without a differential diagnosis to implicate the exact cause, swine erysipelas infection was not suspected. Otherwise, the disease has not been observed to have occurred in an epizootic form, but rather as a seasonal variation in the occurrence of outbreaks. In certain localities of more or less definitely defined area, relatively few herds infected with swine erysipelas make the occurrence of the disease prominent.

In the cases coming under our observation in South Dakota, in which swine erysipelas was positively diagnosed, the disease, for all practical purposes of classifying the types, may be divided into the acute and the chronic. Obviously there were different gradations in the involvements manifest with these divisions, but not so distinct as the line which marked the acute from the chronic type.

The acute type can readily be separated into two stages. The first of these lasts from two to three days, during which the most pronounced abnormality will be a rise in body temperatures to around 160° F. The animal appears healthy, eats well and does not lose condition. Apparently the acute form may terminate with this stage without other manifestations, espe-

cially in pigs or shotes, and nothing may be seen until some time later, where such chronic manifestations as enlarged joints will be observed. This stage may pass unnoticed at the onset of the disease. We have observed this stage more distinctly as a manifestation during the spread of the infection among the animals on a given premise, as from one part to another part of the herd. The animal during this stage may lie in the nest or a sheltered place more than normal, but when approached is alert, runs away, and, if feed is available in the course of its travel, it takes a mouthful, then proceeds to another sheltered bed.

Where the acuteness continues, after about the first three days, a very much more serious stage in the acute form develops. Body temperatures of 107° to 108° F. will be found, and temperatures of 110° F. have been observed. The affected animal appears very sick, off feed, and, if able to walk, the gait is peculiarly stilty and stiff. The feet will be placed much closer together than normal in standing or moving, giving the back a pronounced arch. Pain may be evidenced by squealing when the animal is handled. Sometimes in this stage the animal is unable to get to its feet and lies prone on its side. Breathing is accelerated, throbby or jerky in character. We have counted respirations of 125 per minute, where the mouth was held open, the animal gasping for breath. Such extreme cases usually terminate rapidly in death. If the animal is able to walk, and even with a temperature of 108° F., if made to get to its feet, it will move away rather spryly to the feed-trough and eat. The stiffened gait often leads the owner to believe that the animal has been hurt. When the animal is very weak it may stagger or weave, but the lack of coördination of the hind legs as seen in hog cholera is not evidenced.

Where the acute type of the disease does not terminate in death, more or less chronic developments are noted, all of which we include as a part of the chronic form. In this form, in animals of different ages and localities, one or more of several things may take place. In old hogs, seen more to the south part of our State, many cases have been noted where skin sloughing is a development of the chronic stage. This skin sloughing varied in tissues involved from the skin of an ear to sloughing of the skin from the entire back. In the central and northern parts of the State this manifestation has been seen only in rare instances. Among pigs and shotes, in all parts of the State investigated, the disease terminated very commonly in arthritis, with enlarged joints. Slightly swollen or stocky legs may be observed in the second stage of acuteness but the pronounced

enlargement of joints appears in the chronic stage. Sometimes all joints, even those of the caudal vertebrae, are enlarged. Such enlargements may inhibit movement in the pig or shote. It is stunted, in a miserable condition, and is an economic loss. These enlargements, however, may recede and disappear to such an extent as to escape notice. On two occasions, in the southern part of the State, skin sloughing in pigs has been noted.

The urticarial form of swine erysipelas has been noted in a few cases in the east-central part of the State, and one case in the south-central part, but these cases are rarely seen. The rhomboidal or "diamond skin" forms have not been noted on the skin surface. When seen, this form appears as though the animal had been stung a number of times by bees. The abnormalities appear as small, rounded lumps on the skin. This is a very mild form of infection, and it causes little economic loss.

Some other manifestations commonly observed in a clinical study of disease will be referred to in relation to the occurrence of swine erysipelas as a whole. In old hogs, for example, diarrhea rarely has been seen in any stage of the disease; among small pigs, on the other hand, it is not uncommon. We may here suspect that the mothers were more or less severely affected and the flow of milk had stopped or was profoundly interfered with, leading to digestive disturbances in the pigs, of indirect cause as relates to the specific infection. We have observed forms of enteritis developing in pigs and shotes that seemed to have developed in association with the weakened condition brought about by the occurrence of erysipelas, at least such conditions were corrected as the development of erysipelas infection was checked, and without other lines of treatment being administered. In old hogs, often with temperature as high as 108° F., semi-solid feces will be seen. The animal is not constipated; neither does it have diarrhea. The feces may have a greenish tinge, no doubt caused by an abnormal secretion of bile, for in many postmortem examinations a general congestion of the liver has been observed.

In both young pigs and old hogs the eyes of animals sick of swine erysipelas are abnormally bright. Gluing of the eyelids of pigs, seen so constantly in cases of hog cholera, is absent in swine erysipelas. There may appear to be an abnormal amount of moisture about the eyelids and along the eyelashes, in the erysipelas cases, but this as noted is watery, with no tendency to gluing.

The postmortem findings in swine erysipelas are not constant. After making or witnessing the postmortem examination of the

carcasses of many swine definitely proved to be infected with this disease, we come to the conclusion that there are no constant diagnostic lesions of swine erysipelas. In old hogs affected with the disease, postmortem findings are more to be depended upon as being diagnostic than in pigs so affected.

The most constant lesions found in old hogs are gastritis, and the congestion and thickening in the walls of the urinary bladder. The next most common lesion is the enlarged, congested liver. Many times lymph-nodes will be found enlarged and watery, but other times, in positive cases, this abnormal condition will not be seen. Quite often, the spleen will show enlargement and a tendency toward pulpiness, but this lesion is by no means constant. Spleens apparently normal in size, color and consistency, from affected animals, have been sent to the laboratory, and there yielded the virus of swine erysipelas. Heart lesions are found only exceptionally. The cauliflower growth spoken of in classical description has been a rarity in our work. In all the investigations personally made or witnessed, only two pigs have shown this cauliflower growth to such an extent as to be undoubted. One sick herd observed, in which the disease had run a course of at least three months, was slaughtered as suspects under federal meat inspection. Of the 50 pigs and sows slaughtered, many manifesting symptoms of chronicity, postmortem examinations revealed only one heart that showed such a growth; and then the growth was small. The "paint-brush" stripe on the pyloric end of the stomach rarely has been seen by us.

In suckling pigs, perhaps the more constant lesions are seen in enlarged and edematous lymph-nodes. In some the liver and spleen will be enlarged and congested; there may be gastritis, also a congestion and thickening of the urinary bladder. We have noted all or a part of these pathological changes in different cases but without a constancy of any one of the different abnormalities that would fix the same as diagnostic. It would seem, after many postmortems, that in small pigs there is a tendency toward a paralysis of the urinary bladder. This organ is often vastly distended and full of clear urine.

Small pigs appear to show more complications than do older hogs. There is more lung involvement, the kidneys show more petechiae and there is more peripheral congestion of the lymph-glands. Until the disease has passed somewhat into the chronic stage, so that enlarged joints or soreness of the joints may be observed, diagnosis of swine erysipelas in small pigs is very difficult, unless it is known that the disease exists among the older hogs. Enteritis is a quite common complication among suckling

pigs, but this may be attributed to the cause already mentioned, that of altered milk-flow, either in amount or composition. The reddened skin discoloration of swine erysipelas and that of hog cholera, to us, are indistinguishable in the field.

The diagnosis of swine erysipelas among swine of any age, until recently, in the field, largely depended on history and clinical symptoms. Postmortem findings, as has been indicated, are not constant nor in other ways specific. There are cases, it is true, where the investigator who has had considerable experience with swine erysipelas can make a positive diagnosis of that disease, with a great deal of confidence. With the development of a serological test that gives promise of a reliable specificity, such as we have noted in our use of the rapid agglutination test, the diagnosis of swine erysipelas may be greatly simplified. But after many observations of cases of swine erysipelas, as seen in South Dakota, where the herd has not been treated with anti-hog cholera serum and virus in the hands of an experienced person, and for a period of time sufficient to produce immunity, the fact that swine erysipelas exists should not weigh against the duty of advising the preventive treatment against hog cholera.

In the remainder of our discussion we shall deal more with swine erysipelas as relates to the possible occurrence of hog cholera in field cases. The history one gets in certain cases is confusing. It leaves much uncertainty, especially in herds that have not received the serum-virus treatment, as to whether hog cholera virus may or may not be absent, and swine erysipelas infection the dominant disease factor. We have noted swine erysipelas appearing slowly in a herd, such as would lead one to suspect hog cholera, as compared with other cases where swine erysipelas made its appearance in a sudden onset. From the slowly developing disease we have seen great disaster.

In the sudden appearance of the disease, with the arched back, the stilty gait, and the absence of the barking cough excluded, one might easily make a diagnosis of "flu." These quickly progressing cases usually terminate without much death loss, but with a large percentage of the animals suffering from enlarged joints. If there is no history of hog cholera on the place nor in the immediate locality, one can be quite positive of a diagnosis of swine erysipelas in such cases.

History is important, however, though at times vague. The report that usually incites suspicion is where the owner reports one of the hogs a month ago, or maybe only a week ago had gone off feed for a few days. Later, the same animal had been noticed lame, and then had either recovered or had died. The period of

sickness and inappetence perhaps was slight and did not give the owner any concern. If the animal recovered and was lame, the owner believes it was injured in some way. But later, the whole or a part of the herd has become affected. Almost invariably there will be in the herd one or two animals showing the peculiar stiffness and stilty gait. Such cases are most likely to prove to be swine erysipelas.

Loss of condition in the herd does not occur rapidly, as in hog cholera. Usually the tails are curled. If a sick animal is caught, its squeal is sharp—not weak and hoarse as in hog cholera. In an acute erysipelas infection the temperatures will range around 107° to 108° F., but even higher temperatures have been noted. Breathing is almost always rapid and jerky. Some writers have described a difference between the rapid and jerky breathing of "flu" and of swine erysipelas, but such difference we fail to distinguish. In extreme cases the affected animal is quite often prostrate and gasps for breath, but if made to get up moves away rapidly, to lie down again at the first opportunity. One easily might suspect a severe pneumonia in such cases, but, as a surprise, the lungs are usually not found so involved. There may be some reddened ecchymotic areas, as of hemorrhage on the surface of the lung, but the deeper structure apparently is not disturbed. In suckling pigs there is more often noted the extreme depression. We have observed pigs only three days old suffering from swine erysipelas.

In spite of the sometimes severe congestion of the mucosa of the urinary bladder and occasional hemorrhagic disturbance in the hilus of the kidneys, hematuria has been observed in only one hog. Perhaps the urine in a few cases has been slightly darker than normal but more often it is pale straw-colored to colorless. With the severe gastritis often present, vomiting has not been observed at all in known cases of swine erysipelas. Vomiting in hog cholera is not uncommon. The diarrhea associated with swine erysipelas, as reported in the European cases, has not been observed, unless with complications. Quite often, in very acute cases of swine erysipelas, the affected animals seem to have lost all sense of direction, or else the vision is impaired. They will move about erratically, sometimes keeping in continuous motion, sometimes running head-on into any object in their path. In hog cholera, where the eyes are glued shut, this is often seen, but in pure swine erysipelas these erratic movements cannot be attributed to that cause.

The termination resulting in enlarged joints in many pigs, where swine erysipelas has appeared, has attracted our attention.

A detailed and special study of this pathological condition, often noted as from other causes, such as faulty diet, and seen to some extent in slaughter animals, may prove worth while. Since we have been applying the rapid agglutination test for swine erysipelas, in the field, we have tested many pigs and old hogs. Every single one, where these enlarged joints were noted, gave a positive reaction to the test.

Swine erysipelas in South Dakota has occurred in many different localities but apparently without any marked preference for soil or season. The disease has appeared on heavy soil and on sandy soil; and in the spring, summer, fall and winter. However, we find most cases occurring in the period from spring to the latter part of July. During the extremely hot days of August, the disease seems to abate, only to start up in September. The more serious occurrence of the disease has perhaps been in the area of the heavier, gumbo clay soils.

The course of the disease in the herd is quite often very peculiar. This can best be explained by reference to the disease in certain herds coming under our observation. On one farm there were 110 fall pigs, 27 of which were Durocs. This lot had been purchased and brought to the farm and allowed to run with the others. Swine erysipelas appeared in this lot of 27 and was confined to the lot, although they were never separated from the others. On another farm, the owner purchased 200 pigs. One hundred of these were spotted Polands and 100 were Hampshires. They were allowed to run together. Swine erysipelas appeared among the spotted pigs and to a greater or less extent affected the entire lot. None of the belted pigs were affected. Sometimes only a single animal in the herd appears to become infected or only a small part as indicated by the cases cited, yet again the entire herd apparently may be involved. Breed difference as to susceptibility seems not to deserve consideration, for we have found the disease occurring among all of the various breeds.

As to the matter of treatment in swine erysipelas cases, we consider our experience in this direction much too limited to warrant conclusions, at least such as to be authoritative. However, it has been our privilege to observe quite closely the treatment of a number of herds where swine erysipelas was the disease factor, including the work of Dr. A. A. Fosterman, who perhaps has had more experience with such treatments than has any other practitioner in South Dakota. By reason of these contacts we feel justified in expressing some opinions on the treatment procedure.

Before anti-swine erysipelas serum was released for use in the United States, and even thereafter, more often where the disease was not recognized as such, various treatments of affected herds have been applied, with more or less satisfactory results. Treatments have been administered invariably for curative effect, and the agent most often applied has been some biologic product, which has included among others anti-hog cholera serum. Through the use of the latter product on acute cases of swine erysipelas, some marked benefit apparently has been obtained. It seems that any protein, for a time, may stimulate a hog affected acutely, but what experience we have had with such treatments leads us to believe that the results in this line of treatment are short lived.

Anti-swine erysipelas serum has proved to be very potent in treatment of the acutely affected herd. In a late interview with Doctor Fosterman, he informs us that he believes now that treatment with the serum brings good results only in acute cases of the disease. It is his opinion that treatment after the disease has passed into the chronic form is not satisfactory. Certain observations lead us to believe that the use of erysipelas serum may so overcome the invading infection as to prevent chronic development, particularly the enlarged joints seen in shotes. There may be developed, in some of the animals of the herd treated in the acute stage with the serum, a more or less active immunity sufficient to abort the infection. We are prone to view such an immunity as much of an uncertainty, as in hog cholera immunization, without the use of the specific virus simultaneous with the administration of the serum.

Withal, there is a distinct value to be had in the use of the anti-swine erysipelas serum as a treatment in outbreaks of the disease. As indicated when the serum alone is used much of the appreciated value will be derived only through an early recognition of the disease in its appearance in the herd. Until more data as to the value of serum-alone treatment are obtained, much stress should be placed on sanitation, separation of infected animals from the rest of the herd, and the adoption of some suitable regulatory measures.

A word of caution properly may be added in the subject of treatment. When dealing with swine erysipelas cases, in herds that never have been treated against hog cholera, there should be no question but that either anti-hog cholera serum or the serum and virus should be administered at once; but if hog cholera virus is given, then swine erysipelas serum should be

given at the same time. In herds where the chronic stage of swine erysipelas is manifest, as by the enlarged joints seen in shotes, the serum should be given at the same time that hog cholera virus is administered. Enough cases have been observed where such precaution was not taken, and in which disastrous results followed the treatment, apparently with some relation to the presence of swine erysipelas infection, to warrant the suggestion.

In conclusion, we would stress the fact that these observations have included field cases of swine erysipelas seen as an infectious herd disease of considerable economic importance. We have found the disease a serious hazard to swine production on certain farm premises and in some definite areas. Not alone were these losses to be measured by the mortality rate in the infected herd, but the general set-back in condition of the animals that survive exacts an appreciable toll. Further, many farms, as we have seen some, may become abandoned to hog-raising because of the annual destruction of the herd as the result of the recurrence of the disease. Our impression is that more extended studies, through field observations and laboratory work, are needed immediately more clearly to evaluate this disease as a hazard among swine in the United States.

PRESIDENT MALCOLM: The next is "An Agglutination Test for Swine Erysipelas," by Drs. H. W. Schoening and G. T. Creech, U. S. Bureau of Animal Industry, Washington, D. C. (Applause)

. . . Dr. Schoening read the paper. . . .

AN AGGLUTINATION TEST FOR SWINE ERYSIPELAS

By H. W. SCHOENING and G. T. CREECH

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A preliminary report on a laboratory tube test and a whole-blood agglutination test for the diagnosis of swine erysipelas was made by the writers in the current issue of the *North American Veterinarian*.¹ Since the technic of both tests is described in detail in that paper, it will suffice here to state that the laboratory tube test is the orthodox agglutination test performed in the laboratory with the serum, while the whole-blood, rapid agglutination test is a field test in which a drop of blood from the suspected case is mixed with a quantity of antigen on a glass plate and the reaction read within several minutes. In other words, the technic of this test is similar to the whole-blood, rapid agglutination test for pullorum disease in hens.

The antigen is prepared from a single strain of *Erysipelothrix rhusiopathiae*, the causative agent of swine erysipelas. The organism is grown in liquid media and after incubation for 36 to 48 hours, the organisms are collected by centrifugalization. They are then washed in saline containing 1 per cent formalin, again centrifuged, resuspended in a small amount of the 1 per cent formalin-saline solution, shaken in a machine for one-half hour, filtered through cotton and then standardized to two times No. 1 of the McFarland scale for the tube test and to fifty times No. 1 of the same scale for the whole-blood, rapid test. Cultural and mouse inoculation tests fail to reveal any viable organisms in the finished antigen.

In our preliminary report a serological and bacteriological study was made of both tests in five herds, three of which were affected with swine erysipelas, one with cholera and one with a mixed infection of cholera and erysipelas. Necessary inoculation tests for the presence of the virus of hog cholera also were made. The serological results were in general agreement with the clinic and bacteriology. In addition, sera from 23 normal hogs representing three herds were examined serologically with negative results to both tests. Since the completion of this report, additional investigational work has been done on the subject.

Our studies of the past few months have included a group of 20 different herds from which blood serum and specimen tissues (spleen, kidney, affected joints, etc.) were received. Studies of these materials have afforded an opportunity for comparing our serological and bacteriological results with the rapid, whole-blood tests, clinical findings, and tentative diagnoses made in the field. The field tests and field diagnoses were made by Drs. C. F. Harrington and C. H. Hays, of the U. S. B. A. I., Pierre, S. D., who also submitted the serum samples and specimens for laboratory examination. A summary of the results of these studies is contained in table I.

In accordance with our findings in the different herds, these have been divided into three groups, as will be noted in table II. In the first group, which consisted of 9 herds, the diagnosis of swine erysipelas was based on positive bacteriological results obtained from tissues from one or more animals in each herd. All of the hogs from which tissues were obtained gave positive reactions to both the tube and field tests, with one exception. In this case the reaction was classed as suspicious to both the field and tube test. The animal from which this sample was obtained was in the early stage of the disease. Bacteriological examina-

TABLE I—Summary of agglutination tests on sera of animals in herds from which tissues were received for laboratory examination.

No.	SAMPLES TESTED	TUBE TESTS			FIELD TESTS			BACTERIOLOGICAL RESULTS *	FIELD DIAGNOSIS	REMARKS
		+	?	-	+	?	-			
1	7	0	0	7	Not tested			-	H. C.	H. C. tests positive
2	4	2	2	0	2	2	0	+	S. E.	H. C. tests negative
3	7	3	2	2	3	2	2	+	S. E.	
4	3	2	1	0	2	1	0	+	S. E.	
5	3	2	1	0	3	0	0	+	S. E. and H. C. mixed	H. C. tests positive
6	4	0	0	4	0	0	4	-	Acute H. C.	H. C. tests positive
7	2	1	0	1	1	0	1	-	S. E. and H. C. mixed	Spleen cultured from negative pig. H. C. tests positive
8	2	0	0	2	0	0	2	-	Suipestifer infection	
9	3	0	0	3	0	0	3	-	H. C. and suipestifer infection mixed	No H. C. tests made
10	2	0	0	2	0	0	2	-	Acute enteritis	<i>B. coli</i> and <i>B. suis-septicus</i> obtained from tissues
11	3	3	0	0	3	0	0	+	S. E. with possible H. C.	No H.C. tests made
12	2	2	0	0	2	0	0	+	S. E.	
13	1	1	0	0	1	0	0	+	S. E. with possible H. C.	H. C. tests positive
14	1	0	0	1	0	0	1	-	H. C.	No H.C. tests made
15	2	1	1	0	2	0	0	-	S. E. and H. C. mixed	Tissues cultured from negative pig. H. C. tests positive
16	5	4	0	1	4	0	1	+	S. E.	Disease present in herd for number of months
17	2	1	0	1	1	0	1	-	S. E. and H. C. mixed	No H.C. tests made
18	3	3	0	0	3	0	0	+	S. E.	Disease present in herd some months
19	2	1	1	0	2	0	0	+	S. E. and suipestifer infection	
20	1	1	0	0	1	0	0	+	S. E.	

H. C. = hog cholera.

S. E. = swine erysipelas.

*Tissues for bacteriological examination consisted for the most part of spleen and/or affected joints.

TABLE II—Summary of results of agglutination tests by diseases.

DIAGNOSIS	HERDS	SAMPLES	TUBE TESTS			FIELD TESTS		
			+	?	—	+	?	—
Swine erysipelas*.....	9	30	21	6	3	22	5	3
Swine erysipelas and hog cholera mixed†.....	5	10	6	2	2	8	0	2
Hog cholera, suipestifer infection and other conditions‡..	6	19	0	0	19	0	0	12

*Diagnosis based on bacteriological examination.

†Diagnosis based on laboratory findings and field observations.

‡Diagnosis based on field observations.

tion of the spleen of this case revealed the presence of the erysipelas organism.

From further consideration of this group of 9 herds, it is of interest to note the rather close agreement of the results of the field and laboratory tube tests. One sample was positive in the field and was considered questionable on the tube test. There was complete agreement other than in this instance. In the second group, which consisted of five herds, the diagnosis of a mixed infection of swine erysipelas and hog cholera was based on laboratory findings and field observations. Ten samples of serum were tested in this group. Six were positive, two questionable, and two negative to the tube test, while on field tests, eight were positive and two were negative. In the third group, listed as hog cholera, suipestifer infection and other conditions, the diagnosis was based on field observations. Of 19 samples tested from this group by the tube method, all gave negative results. In the field tests 12 samples were tested with negative results.

It would seem from a practical standpoint that an agglutination test would be best employed as an aid in establishing a diagnosis of swine erysipelas in a herd, rather than in individual animals and that it would be necessary to test the blood of a number of animals before reaching a conclusion.

The fact that hog cholera and swine erysipelas may exist in the same herd at the same time also brings out the important fact that a positive reaction to the test for erysipelas does not exclude the possibility of the presence of hog cholera infection.

Further inquiry also has been made into the question of the specificity of the reaction. In the literature on swine erysipelas, it is stated that the causative agent, *E. rhusiopathiae*, may be harbored by apparently normal swine in their tonsils or other

tissues. If this be the case, it is of importance to know if the blood of such animals contain specific antibodies and to what extent.

To gather information on this subject, we have made laboratory examinations of the tonsils of a number of apparently normal animals and also have subjected their serum to the tube agglutination test. These materials came from a herd of hogs in which a disease had appeared some time prior to the date of these examinations and which was suspected as possibly being swine erysipelas. Unfortunately we had no opportunity to study the disease in this herd. The animals at time of slaughter were in a normal condition.

Of 87 tonsils examined bacteriologically from animals in this herd, *E. rhusiopathiae* was recovered in but one case. All the tonsils showed the presence of a large variety of organisms to such an extent as to make bacteriological examination a difficult procedure and we feel that the negative findings do not definitely indicate that the organisms might not have been present in more of these specimens.

Of the 87 samples of serum, 60 gave negative reactions to the test, 9 were positive and 18 suspicious. Inasmuch as 27 of these samples gave evidence of agglutination to varying degrees we arbitrarily and tentatively considered a reaction positive if definite clearing and clumping was observed in the first three tubes (1:25, 1:50, 1:100). Any evidence of agglutination less than this was considered suspicious.

From the results of these tests it appears that serums from some apparently normal hogs may cause more or less agglutination in the lower dilutions. When such serums are used in the rapid plate test, agglutination usually occurs in from one to three minutes and it appears that the degree and rapidity of the reaction is influenced by the amounts of serum and antigen used. Whether this reaction is specific we can not say.

With serum from natural cases of the disease from the field, definite clearing and marked clumping in the tube test is usually noted in at least the first four tubes (1:200) and in the great majority of cases tested in all six tubes (1:1000 or higher). When these serums are used in the plate test, very marked clumping usually occurs in from 15 seconds to one minute. This reaction is not influenced by varying the amounts of serum and antigen within the limits that this variation affects serums of apparently normal hogs. Experimentation on the relationship be-

tween the amounts of serum and antigen, however, has been limited.

In the whole-blood plate test, known positive cases cause a marked clumping in from 15 seconds to two minutes. With the blood of apparently normal hogs in some cases, clumping to varying degrees has been noted after two to three minutes. When two drops of antigen to one of blood are used this is less marked, but these same proportions do not interfere with positive reactions.

We have considered reactions positive only when marked agglutination appears within two minutes, with one drop of blood and two drops of antigen. In cases of arthritis due to erysipelas infection, marked agglutination occurs usually within a minute with the whole-blood test. With a few exceptions our positive reactions have come from this type of the disease.

We have been unable to gather any information on how soon antibodies develop after infection, due to the difficulty of producing the disease experimentally. This is an important point in the diagnosis of an acute disease and if antibodies are late in developing, little aid can be expected from the test in diagnosing the disease in its early stages.

Our observations to date indicate that where the disease has reached the arthritis stage, antibodies are present in considerable quantities. In the preparation of the antigen we have overcome the difficulty of spontaneous agglutination of the organisms. However, we have noted recently that some lots of antigen have become quite sensitive so that apparently some non-specific agglutination occurred with normal serums. All antigens have been prepared with the same strain and in so far as possible in a similar manner, and we are unable to say at this time why there should be a difference in sensitiveness. Many factors influence the preparation of an antigen and the method of procedure in conducting an agglutination test. That long and carefully controlled experimentation is necessary to throw light on these points is well illustrated by the extensive and painstaking work done in recent years with agglutination technic for infectious abortion.

That further experimentation is necessary in the laboratory and field studies of the agglutination technic herein reported to determine its practical application to the diagnosis of swine erysipelas in the field is quite apparent.

REFERENCE

- ¹Schoening, H. W., Creech, G. T., and Grey, C. G.: A laboratory tube test and a whole blood, rapid agglutination test for the diagnosis of swine erysipelas. No. Amer. Vet., xiii (1932), 12, pp. 19-25.

PRESIDENT MALCOLM: The next is "The Feeder-Pig Problem," by Dr. U. G. Houck, U. S. Bureau of Animal Industry, Washington, D. C. (Applause)

. . . Dr. Houck read his paper. . . .

THE FEEDER-PIG PROBLEM

By U. G. HOUCK, Washington, D. C.

*Chief, Division of Hog Cholera Control
United States Bureau of Animal Industry*

Although traffic in feeder pigs is not a new industry, there was a time within the recollection of the older hog-raisers when most of these pigs were produced on the farms where they were to be finished for market. When additional animals were needed, they were procured usually within wagon-hauling distance.

Concurrently with the development of artificial immunization against cholera and the extension of transportation facilities, changes were gradually inaugurated in the hog-raising industry. Many farmers of corn-growing states gradually reduced, or relinquished entirely, their breeding operations because they found it advantageous to purchase shoters rather than to maintain breeding herds and raise pigs to the feeding age.

On the other hand, farmers in sections where conditions were not favorable for producing large crops most suitable for feeding hogs to maturity found it more profitable to sell their pigs at the feeding age than to keep and finish them for the slaughter market. As a consequence, feeder pigs were produced for a time in increasingly large numbers and were moved from one locality to another within a state and from state to state.

Public live stock markets gradually developed an extensive, unrestricted, feeder-pig business. As might be expected, these pigs carried with them to their destinations the diseases and parasites which were prevalent at the point of origin and the infections acquired at railroad shipping-pens and the public market-places. Hog cholera was disseminated frequently through these shipments. Foci of infection traced to feeder pigs of miscellaneous origin figured prominently in the widespread prevalence of this disease in 1913.

Immunization against cholera was in its infancy at that time. Faith in the prophylactic treatment had not yet been fully established; the technic of administration was far from perfect and

much virus of low virulence and serum of questionable potency were being produced and sold. And there was no federal or state supervision over the production and distribution of these biological products.

Reports of heavy losses from cholera for a number of years prior to 1913, not only in shipper pigs but also in the herds to which they were added, became so increasingly prevalent and alarming that both federal and state authorities realized the imperative necessity for appropriate action to establish confidence in the immunization treatment and in other ways protect, as far as possible, the swine industry from unnecessary losses.

The states promulgated new regulations to meet the situation. Some state institutions began the production of anti-hog cholera serum, which was later discontinued. The Bureau of Animal Industry succeeded in obtaining an appropriation of \$75,000 from Congress, available July 1, 1913, which enabled it to study hog cholera under field conditions, and to increase the production of serum at its Ames, Iowa, hog cholera experiment station and with this serum undertake to demonstrate in selected counties of several states the reliability of serum and virus as immunization agents when properly prepared and applied.

The Congress passed the Virus-Serum-Toxin Law, approved March 4, 1913, requiring that plants which engage in the production of anti-hog cholera serum and hog cholera virus must hold a license from the Secretary of Agriculture before their products are eligible to enter the channels of interstate trade. Thus the operations of these plants were placed under federal supervision.

As a further safeguard, regulations (B. A. I. Order 210) were issued by the Secretary of Agriculture, effective July 1, 1914, requiring the immunization under federal supervision of all feeder pigs that were to be shipped from public stockyards. The regulations further required that suitable facilities be provided at a separate place in stock yards where feeder pigs are to be immunized and that the immunized pigs be disinfected and certified before being shipped. These regulations have been modified from time to time to meet developing conditions and are still in effect.

Shipments have been made from public stockyards under these regulations as follows:

<i>Year</i>	<i>Pigs</i>	<i>Year</i>	<i>Pigs</i>	<i>Year</i>	<i>Pigs</i>
1915	20,759	1921	386,130	1927	717,176
1916	56,494	1922	393,295	1928	546,380
1917	94,720	1923	458,097	1929	471,902
1918	254,731	1924	509,567	1930	388,676
1919	614,673	1925	352,116	1931	287,895
1920	574,558	1926	425,995	1932	322,618

In all, approximately seven million feeder pigs have been shipped from public stockyards since 1914 under B. A. I. regulations.

In the beginning an attempt was made to obtain reports on the mortality of the immunized pigs after reaching destination. Many of the owners failed to respond to our request for information and the reports received were so confusing and, evidently, so undependable that the attempt to obtain this information finally was abandoned.

There have been losses in feeder pigs immunized at public stockyards and it may be expected, in view of unavoidable conditions, that even under the most competent supervision of the operations some losses will continue to occur. It has been suggested that in view of these losses the public stockyards feeder-pig business might well be discontinued.

In regard to this suggestion, it is apparent, from information obtained through various reliable means during the 18 years, that feeder pigs have been immunized and shipped from public stockyards under federal supervision, that the losses in these pigs on the whole have been no greater than in pigs obtained from other sources. It is also apparent that the losses have occurred principally in pigs that have been subjected to the longest hauls and consequent delays, rehandling, exposure and privations.

The system of immunization practiced at public markets under federal supervision was inaugurated to meet existing conditions in as practical a way as possible. In the application of this system it is realized that it is impossible to eliminate every animal in the incipient stage of cholera, or others in improper condition to withstand virus, and that the pigs are started on journeys to their final destinations sooner than is desirable after immunization.

Frequently pigs arrive at public markets in a debilitated condition due to parasitic infestation, filth-borne diseases, starvation, exposure, or fatigue from long journeys in overcrowded cars. It is surprising that the mortality is not higher. The federal inspectors at these markets deserve much credit for the vigilance and judgment displayed in their work.

In view of the facility of obtaining feeder pigs at public stockyards, the economic importance of the industry, and the comparatively small losses when good judgment is exercised in the selection and care of the stock, most hog-raisers are of the opinion that there should be no interruption of the stockyard, feeder-pig business.

The recognized danger of animals acquiring infections through railroad transportation, together with reports of losses in stockyard shipments, have tended to divert a considerable volume of the feeder-pig business from public markets to country points. Apparently, about one-half of the feeder-pig supply is purchased and shipped from points other than public stockyards. Much of this stock is moved by motor truck. With the development of the motor truck we are faced with the serious problem of controlling motor transportation of feeder pigs and other live stock.

In view of rulings of federal courts which invalidate the authority of state regulations affecting interstate shipments of live stock, there is a sentiment in some quarters that the federal government should supply promptly the necessary protection against infection from feeder pigs moved by motor trucks or otherwise. Resolutions have been passed at meetings of state live stock sanitary officers to that effect. This Association at its last meeting acted on one of these resolutions.

Any regulation which the federal government might promulgate would apply equally to all states. Since the conditions in regard to hog cholera vary from year to year in different states, and even in different parts of the same state, uniform regulations would in many instances result in injustice, hardship, and dissatisfaction. It could not be expected that the Secretary of Agriculture could promulgate regulations in this instance, which would be practical to all sections of the United States.

Further, the policing of all avenues of motor traffic among the 48 states would be an impossible undertaking with the available funds and men. Observation and experience warn that it is preferable to defer federal regulation than to issue regulations that can not possibly be enforced.

Sentiment in the last Congress was favorable to the joint resolution urged by this Association, which is intended to give to state laws and regulations, in the absence of regulations by the Secretary of Agriculture, the validity necessary to protect the states against invasions of destructive diseases from other states. Congressional action was deferred on the resolution on account

of economic relief measures which occupied the attention of the Congress to the end of the last session.

Your faithful, energetic Committee on Special Legislation will not fail to seek favorable action on this resolution at the first opportunity. The Bureau of Animal Industry will coöperate with this Committee in every way possible. With the passage of this resolution, the states will be in position of authority to do locally what the federal government is not in position to undertake on a national scale with any prospect of general success.

The most dangerous practice that has developed largely from motor transportation, and which is increasing in extent and importance, is the marketing of feeder pigs in increasing numbers through auction sales. The assembly pens at the point of origin usually are infected, the motor trucks may be infected, verbal assurance or even certification as to immunization is not always reliable, and the auction yards and the pigs offered for sale frequently are infected. Whatever the contributing conditions may be, it is common knowledge that cholera appears in a large proportion of the pigs sold at public auction, that they may spread infection while in transit, and that frequently they do carry the disease to the home herds of the purchaser.

It has been advocated in the proceedings of this Association and on the floor that a system of strict licensing and supervision of auction sales, including immunization of the stock against hog cholera when considered advisable, be inaugurated by the states to improve present conditions and reduce preventable losses. Some states have taken steps along this line, but they seem to be "stepping lightly" due to the lack of funds to carry out any effectual general plan. There is no question in regard to authority of the states to control auction sales and assembly stations; also to supervise the intrastate movement of shipper pigs and to impose quarantines.

The basic problems in the feeder-pig industry are the prevention of the spread of infection and a reduction in the mortality. Others arise in connection with their solution.

Proper immunization is our most hopeful recourse.

Comparatively few feeder pigs are immunized at the point of origin. It has been suggested that in making interstate shipments the ideal procedure would require the immunization by serum alone immediately when the pigs arrive at assembly stations, and administration of the simultaneous treatment within five days following arrival of the pigs at final destination. While this procedure would increase the price of feeder pigs, it would no doubt prevent most of the present losses from cholera in such

pigs. We can hardly expect the states to adopt this ideal procedure at this time, but it will not be surprising if state regulations will require, as conditions for importation, a permit for all interstate shipments of feeder pigs and immunization by the simultaneous method, administered by an authorized veterinarian at the point of origin at least five, or preferably ten days before the animals are shipped in properly disinfected cars or trucks.

Farmers and feeders in some sections of the country believe that losses could be prevented if they were permitted to bring the pigs to their premises and have them immunized there under their personal supervision. Many have expressed a desire for the privilege and there seems to be no valid objection to this procedure in the case of intrastate shipments where the hauls are comparatively short, provided the purchasers do not fail to have the pigs immunized within a specified time after arrival.

Among other problems which might properly be discussed, if time would permit, are:

The selection of feeder stock.

Conditions which increase the susceptibility of feeder pigs to infection.

Yards, pens and vehicles used in marketing feeder pigs.

Transportation, including bedding, overcrowding, protection from the weather, feed and water.

"Scalping" and the "bootleg" traffic in feeder pigs.

The feed-lot.

Also, care of feeder pigs on arrival at destination, especially precautions in regard to sudden change in feed and overfeeding. Undoubtedly the mortality in feeder pigs is greatly increased through ignorance or indifference on the part of purchasers in regard to proper feed and care during the first two weeks following the arrival of the animals.

The federal government, state live stock sanitary authorities and the purchasers of feeder pigs share alike their respective duties and responsibilities in the protection of the feeder-pig industry. These duties and responsibilities cannot be escaped if the best possible results are to be obtained.

PRESIDENT MALCOLM: We will now hear the report of the Committee on Transmissible Diseases of Swine, by Dr. Charles Murray, Ames, Iowa. (Applause.)

DR. MURRAY: The Chairman desires to thank the essayists who have taken the time to prepare papers for our part of the program.

. . . Dr. Murray then read the report. . . .

REPORT OF COMMITTEE ON TRANSMISSIBLE DISEASES OF SWINE

DR. CHAS. MURRAY, *Chairman*, Ames, Iowa.

Dr. R. R. Birch, Ithaca, N. Y.

Dr. U. G. Houck, Washington, D. C.

Dr. R. A. Craig, Lafayette, Ind.

Dr. C. McCandless, Salem, Ohio.

Dr. C. H. Hays, Pierre, S. Dak.

Dr. J. H. Rietz, Morgantown, W. Va.

During the past two years, but more especially within the period of the calendar year 1932, swine erysipelas of an acute septicemic type has been recognized, and positively identified as such, in several of the mid-western and principal hog-raising states. The disease in this form, as a herd involvement, has been the cause of serious loss to the swine-owner in many such outbreaks. The number of cases reported during the present year, from various locations, indicates a considerable prevalence and wide distribution of the disease in the United States.

This appreciable increase in the prevalence and distribution, as now seen, has been the development of a much greater period of time than is evidenced by the period in which these outbreaks have been reported. Due to increased alertness of veterinarians in their efforts to determine the presence of the disease, together with their increased familiarity with its symptoms and lesions, a high rate of increase at this time may be anticipated. However, it is obvious that an actual increase in the number of cases noted has been occasioned more recently, either through the spread of the causative agent, or through increase in its virulence. In this instance, the infection has been capable of producing a type of disease not heretofore reported, except on rare occasion, among American swine.

Information brought to the attention of your Committee prompts us to issue a word of caution.

First, as to the prompt determination of the presence of the disease. The early recognition of the disease in an outbreak is fundamental to successful prevention of the spread of the infection. Those persons who are called upon to investigate or otherwise attend diseases involving swine herds should avail themselves of every facility for making a specific diagnosis where there is suspicion of swine erysipelas. But, any undue alarm from over-emphasis of the fact of the disease should be avoided.

Second, the complexities that may attend a differential diagnosis, particularly as between swine erysipelas and hog cholera, should be appreciated fully. There is grave danger of having hog cholera infection obscured or otherwise overlooked where such infection is present simultaneously with other infection such as that of swine erysipelas. The elimination of the danger from hog cholera virus must be in the manner that has proved most practical and satisfactory, that is, through proper immunization. It has been indicated, by the reports that have come to us, that the use of anti-swine erysipelas serum and anti-hog cholera serum may be simultaneous without any apparent bad effects from such combination. The Committee commends such treatment only in cases where both diseases have been definitely diagnosed.

Third, the possibility of spreading swine erysipelas by distribution of hog cholera virus obtained from pigs in the early or even later stages of erysipelas constitutes a hazard that merits the attention of serum-producers and inspectors. Every effort to prevent such contingency is recommended.

Fourth, your Committee recognizes that much value is to be had from treatment with anti-swine erysipelas serum but would call attention to the added and material benefits that are to be obtained by the adoption of sanitary measures for controlling the spread of the disease. The removal of the affected animals from the noninfected part of a herd to isolated quarantine has yielded valuable results. This principle of animal hygiene, proved in dealing with individual herds, is recommended as a basis for regulatory measures to restrict and prevent the spread of the disease as from farm to farm, or from one state to another.

Extended studies of the disease in the United States by state and federal officials is advisable. This should incorporate laboratory work and field activities correlated to make possible proper contact with the field occurrence of the disease. The Committee commends to the thoughtful consideration of all veterinarians, and those concerned with the control of animal diseases, the papers dealing with this disease presented at this meeting.

This Committee is of the opinion often expressed by former committees, that hog cholera continues to be the most important of swine diseases. It has been enzootic in many sections of the Corn Belt during the spring and summer. A general outbreak of cholera did not occur this fall as predicted, in part possibly due to the lighter traffic in feeder pigs. Post-vaccination losses were common in the spring and summer. The two conditions responsible for these losses were: the minimum doses of serum given pigs vaccinated by the serum-simultaneous method, and the vaccination of diseased pigs without determining their condition or giving large doses of serum and recommending special care following vaccination. This experience has given greater emphasis than ever before to the necessity of administering a safe dose of serum to pigs vaccinated by the serum-simultaneous method. The apparent relationship of vaccination shock to anemia of pigs, as demonstrated by the U. S. Department of Agriculture and reported by Dr. C. N. McBryde, emphasizes the importance of careful pre-vaccination examination of pigs presented for simultaneous treatment.

The relation of epizootics of hog cholera to the intra- and interstate movement of cholera hogs has been emphasized by live stock sanitary officials for many years. The reports of this Committee have been largely recommendations relating to the enactment and enforcement of laws and regulatory measures for the control of this disease. If regulatory measures making hog cholera a reportable disease and subject to quarantine were enforced, it would stop the intra- and interstate movement of cholera-exposed and sick feeder hogs and result in a reduction in the number of sick hogs marketed for slaughter and eventually eliminate stockyards and pork products as sources of infection.

The increasing number of assembling and sales yards, other than public stockyards which are operated under federal inspection, for traffic in feeder pigs, multiplies the opportunities for spreading diseases of swine. In some states these yards have been shown to be the source of serious outbreaks of cholera. The increased volume of business done by them has been accompanied by correspondingly increased and heavy losses.

More rigid state control of import shipments and auction sales, including permits for auction sales and veterinary supervision and inspection of animals offered for sale, is recommended. The rules and regulations prescribed by the U. S. Bureau of Animal Industry governing the movement of swine from public stockyards where federal inspection is maintained are recommended as fundamental in all details to such control supervision and inspection.

DR. MURRAY: I move the adoption of the report.

. . . The motion was regularly seconded, put to a vote, and carried. . . .

PRESIDENT MALCOLM: The next report will be that of the Committee on Parasitic Diseases, by Dr. E. A. Benbrook, Ames, Iowa. (Applause)

. . . Dr. Benbrook read the report. . . .

REPORT OF COMMITTEE ON PARASITIC DISEASES

DR. E. A. BENBROOK, *Chairman*, Ames, Iowa.

Dr. Maurice C. Hall, Washington, Dr. W. W. Dimock, Lexington, Ky.

D. C. Dr. I. E. Newsom, Fort Collins, Colo.

Dr. H. B. Raffensperger, Moultrie, Dr. B. T. Simms, Corvallis, Ore.

Ga. Mr. C. L. Johnson, Hartford, Conn.

I. INTRODUCTION

The economic depression, through which agriculture has been and is passing, increases the difficulty of controlling parasitic diseases of live stock. Many animal-owners feel that they cannot afford the expense of veterinary service. Thus, control measures formerly found effective have been neglected, often in favor of apparently cheap yet ineffective procedures offered by various agencies, whose so-called services are attractively presented to the worried owners of sick animals.

During and following the depression, every effort must be made to maintain control measures of known practical value. Neglect will result in a retrogression of many years.

Our present knowledge of parasite control is based almost entirely upon careful, and usually expensive, research. The spread and application of the knowledge gained by research usually takes years to accomplish. Limited funds now available will retard the progress, if not the spirit, of investigation in this country. There is great need, therefore, to increase with renewed vigor the attack upon parasitism, using known weapons. Preventive measures usually can be carried out with relatively little expense and should be considered as forms of live stock insurance.

The veterinarian must familiarize himself more with the best offenses and defenses against parasites; and then, by his sincerity and professional efficiency, he will impress upon his clients the value of his services. A vigorous veterinary profession and enlightened owners of live stock are parasites' greatest enemies.

II. REVIEW OF MEETINGS, 1912-1931

It has been both interesting and profitable to review the activities of the United States Live Stock Sanitary Association for the past twenty years. For about half of that period, the Association's chief concern was with the infectious diseases: tuberculosis, hog cholera, anthrax, blackleg and Bang's disease. Texas fever and tick eradication were inseparably emphasized throughout that period. The only diseases due to parasites *per se* that received adequate attention were scab and mange. Some attention was paid to cysticercosis, dourine, Buffalo gnats, stomach worms of sheep and cattle and coccidiosis of cattle and poultry.

In 1921, sheep scab, sarcoptic mange and lice of cattle, and ascariasis of swine were discussed. A quotation from the report of the Committee on Live Stock Diseases for 1921 is significant, in that it appears to mark a turning point in the attitude of the Association toward parasitism:

"The part played by the gross parasites of animals is receiving the attention of many investigators; and facts of unquestioned practical value are gradually coming to light. This committee is especially gratified that some of our most competent investigators are applying themselves to a study of life histories of many helminths, and that the efficiency of time-honored vermicides and vermifuges is being challenged by exact experimental methods."

In 1922, 1923 and 1924, the discussions included those on sanitation in the control of swine parasites, soil contamination, and sheep and cattle scab.

In 1925, again, the problem of ascarids of swine was emphasized; and the relationships of the protozoa *Trichomonas suis* and *Balan-tidium coli* to infectious necrotic enteritis of swine were shown. Iodin as a disinfectant against nematode eggs and larvae was proposed. Coccidiosis in lambs and scabies and mange received considerable attention. In 1925, for the first time, a parasite survey including ten of the states was presented to the Association.

In 1926, a Committee on Parasitic Diseases first was formed. This committee of nine asked that the Association sponsor a parasite survey of all the states; reports eventually to be forwarded to the Zoö-logical Division of the federal Bureau of Animal Industry for compilation and coördination. The report was received and referred to the Executive Committee for action. No action was taken. Also, at the 1926 meeting, there was read a paper on "The Parasite Problems of the Live Stock Industry in the United States and in Central America," by Dr. M. C. Hall. This paper should be studied today with profit.

In 1927, the three members of the Committee on Parasitic Diseases again urged the Association to act on the recommendations made in 1926. Again in 1927, Dr. M. C. Hall presented an analysis of the situation entitled, "Are We Losing the War on Parasites of Live Stock?"

In 1928, the Committee's discouragement was evidenced by their statement that:

"In view of the fact that previous recommendations of the Committee have not been acted upon by the Association or its Executive Board, this Committee has no recommendations to make."

In 1929, the Committee on Parasitic Diseases made a brief but valuable report, calling the attention of the Association to the spread and increase of parasitic diseases in the United States; and asked that the Association each year at least listen to and discuss the more important developments.

In 1930, the President's address contained this statement:

"This Association can be of great assistance in outlining a program looking to the extermination of animal parasites."

A committee report briefly reviewed outstanding developments and control measures; and recommended support of the research work of various agencies. Surveys of parasites made from three areas of the country were presented.

In 1931, two papers on poultry parasitism were given. A committee of nine members conducted a country-wide sectional survey of parasites which was more inclusive than any survey heretofore made. Constructive recommendations were offered and particular attention was called to the effectiveness of the parasite "campaigns" operating in some parts of the country.

III. COMPILATION OF REPORTS OF COMMITTEE MEMBERS ON
PARASITES AND THEIR CONTROL

This year, the seven members of the Committee on Parasitic Diseases were each assigned an area of the United States from which to make a survey of parasites and to report advances made along the lines of control. To those members who so willingly gave their time and effort to this work, the Chairman owes his sincere thanks.

The 1931 report* of this Committee should be consulted by those seeking information on the extent of parasitism in the United States.

As far as the situation during the past year is concerned, no highly significant changes are apparent. There is reason to believe, however, that the neglect shown parasitism, especially during the recent years of economic stress, will result in the re-establishment of parasites in areas more or less freed from them; and will result in an increase in losses where formerly losses have been reduced.

The situation in general may be reflected more or less accurately in the following quotations from reports received from members of this Committee:

"In general, parasites are neglected."

"There are too few persons with live interest in the subject and with authority to inaugurate and push programs."

"Preventive measures are not particularly well understood."

"No one knows, nor is there any way at present to ascertain, the percentage of animals affected."

"The greatest losses are due to internal parasites, but more attention should be given to external parasites."

"We need more study and definite plans for control, if the live stock industry is to maintain a profit."

"Parasitism produces much more loss than is generally appreciated. It means that in order to supply the market, poor as returns are, many more breeding animals must be maintained than are necessary."

"In the practical application of control measures, we can divide the live stock owners into two groups. First are those engaged in breeding; raising their own supply and selling the surplus; purchases being limited to one or a few animals for the purpose of maintaining their herds in production and breeding. The other group includes those who make a business of buying the major portion of the animals maintained on the farm. This group includes the feeders and all who are more or less actively engaged in the traffic of animals. In the first group, parasite prevention is possible, providing the owner is properly advised and is willing to conduct his live stock operations on a plan outlined for parasite prevention. To those of the latter group, disease prevention, with particular reference to parasites, is almost impossible."

In contrast to the foregoing rather discouraging yet stimulating remarks, a few bright spots were found in the Committee's reports as follows:

"The seriousness of parasitic diseases is becoming more appreciated each year. Large numbers of inquiries regarding treatment are being received."

"Considerable educational work is being done on the treatment and prevention of parasites."

"There is a growing appreciation by the animal-owning public of the importance of parasitism from both the economic and health viewpoint."

*Jour. A. V. M. A., lxxx (1932), n. s. 33 (3), p. 484.

"The practice of rotation of runs and pastures is being taken up to some extent."

"Improvement may be attributed to the enforcement of the laws of sanitation and to a certain extent to treatment."

"It is not apparent that parasitic diseases have gained ground since the last survey."

"There is no doubt but that the instructive literature distributed by agricultural institutions and the services rendered by veterinarians and extension workers are important factors in preventing parasitic diseases from developing into a problem of major proportions."

PARASITES OF HORSES AND MULES

The campaign against bots in Iowa and Illinois has been halted somewhat by economic conditions, but it is hoped to keep the subject alive so that the attack may be resumed in greater force later. Most of the horse-owners feel that thriftiness in their treated colts, and increased working ability and decreased gastro-intestinal disorders in horses have more than justified the treatment. Reports from Colorado indicate that bots are quite as prevalent there as farther east.

In Kentucky, considerable treatment is being carried out for horse ascarids and strongyles, and on some farms attempts are made to prevent parasites in colts.

Strongyles, ascarids, bots, oxyurids and tapeworms appear to be the leading horse parasites in about the order named. Oxyurids are quite frequent in Tennessee, whereas in Iowa they are infrequent. The large tapeworm, *Anoplocephala magna*, appears to be increasing in the Middle West.

PARASITES OF CATTLE

Ox warbles and coccidia are widely distributed. From the South come reports of stomach worms (*Haemonchus contortus* and *Ostertagia ostertagi*); also nodular worms (*Oesophagostomum radiatum*), hook worms (*Bunostomum phlebotomum*) and species of lung worms.

Cattle scab, once a leader among parasitic diseases, is reported as only occasional in the Rocky Mountain region.

Less internal parasitism occurs in cattle than in the other food-producing animals in this country.

PARASITES OF SHEEP

Coccidiosis is an important problem in feeder lambs, especially in Colorado. Placing the lambs on a ration of wild hay, instead of alfalfa hay and grain, appears to reduce the mortality from 10 or 12 per cent to 2 or 3 per cent.

The tapeworm *Moniezia expansa* is quite common in the Rocky Mountain and Middle West regions, and, in Colorado, is reported as causing losses of a toxic nature unaccompanied by emaciation.

Liver flukes are reported from Utah, but not to any extent from Colorado, Wyoming, New Mexico and Arizona.

Encouraging results are reported in combating the common sheep stomach worm, *Haemonchus contortus*, especially when pasture rotation is used in addition to the copper sulfate-nicotin sulfate treatment.

The small nematodes *Ostertagia circumcincta*, in the abomasum, and *Trichostrongylus instabilis*, *Cooperia curticei* and *Nematodirus filicollis*, in the small intestine, frequently are overlooked as causes of loss in lambs in the Middle West. Close examination of the gastro-intestinal mucosa in a strong light, using a hand lens if necessary, is absolutely essential in making a field diagnosis.

The nodular worm, *Oesophagostomum columbianum*, aside from its effect upon lambs, is frequently the cause of losses among breeding

ewes, when the nodules become numerous enough to cause intestinal stenosis, adhesions and even rupture followed by peritonitis.

In Iowa, the fringed tape worm, *Thysanosoma actinioides*, has been found associated with a severe cholecystitis and cholangitis.

Sheep scab appears to be well under control as a result of persistent attacks by federal and state forces.

PARASITES OF SWINE

Coccidiosis of swine is still under investigation by research workers.

Progress is being made in controlling the common round-worm, *Ascaris suum*, but the chief obstacle, at least in the Corn Belt, appears to be the lack of clean pasture areas on which to raise pigs. The average swine-raiser seems to be content in maintaining an excessively large herd of brood sows, with the hope that repeated medication will tide the pigs over the worm period until they are marketed. This is in spite of the fact that, in general, those who do practice swine sanitation are obtaining excellent results.

In the South, the methods outlined by the Bureau of Animal Industry against kidney worms and nodule worms are reported to be effective.

The situation as regards trichinosis in swine is such as to cause the veterinary and medical professions considerable concern. Rats in the vicinity of packing houses and swine-feeding-yards are becoming heavily infested with trichina, as may be demonstrated by artificial digestion procedures on rat carcasses. The public should be warned again of the danger of eating raw pork in any form unless it has been subjected to special freezing or pickling processes. It seems rather amazing, with the many kinds of sausages available, that persons will deliberately endanger their health and lives by eating improperly prepared raw pork sausage. Trichinosis is without doubt the most deadly of the parasitic diseases transmissible from animals to man in this country. Swine sanitation and intensive destruction of rats are suggested as measures leading to economic and public health benefits.

Lung worms, thorn-headed worms and stomach worms are reported as being prevalent in swine in many areas this year.

PARASITES OF POULTRY

Little change from the situation of last year is reported. In general, where poultry is raised as a distinct industry, parasites are being reduced to a greater extent than in the average farm poultry flock. Veterinarians are realizing more and more the necessity of informing themselves regarding poultry parasites, and their prevention and treatment as now known. The average poultry-raiser still regards the drug store and the travelling medicine peddler as reliable sources of help in solving disease problems. Much education is necessary to overcome this attitude.

Tapeworms, common round-worms, cecal worms, coccidia, mites and lice still lead the list of poultry parasites. For some members of this group quite effective control may be had. Serious disturbance occurs in some areas from gape worms, capillaria worms and gizzard worms.

Parasites of dogs, cats and fur-bearing animals will not be considered in this report, although certain parasites of these animals are transmitted to or from the food-producing animals and man.

IV. RECENT ADVANCES IN PARASITOLOGY

Information obtained from Dr. M. C. Hall indicates that during the past year almost a thousand articles on parasitologic subjects have appeared in over 400 periodicals. To review all the articles dealing

with parasites of food-producing animals alone would be an imposing task. One journal in this country, the JOURNAL of the American Veterinary Medical Association, for the period October, 1931, to September, 1932, published 16 articles on parasitism, listed 10 talks on parasites given at state association meetings and conferences; and, at the annual meeting of the Association, in August, 1932, there were 11 papers and demonstrations on parasites presented. This is encouraging because it shows a growing interest in the subject.

The following notations may give some idea of the scope of the investigations of parasites of food animals published during the past year:

1. Success in the treatment of sheep for gastro-intestinal parasites has been shown to be limited by the degree of stocking of pastures.
2. Precipitin and skin tests have been developed as aids in the diagnosis of trichinosis.
3. Four species of nodule worms have been found in swine in the United States and the development of one of them, *Oesophagostomum longicaudum*, has been traced.
4. The life cycle of the kidney worm of swine, *Stephanurus dentatus*, has been demonstrated.
5. The sheep liver fluke, *Fasciola hepatica*, has been extensively studied in Oregon and in California, and a campaign in California, lasting three years, has almost eradicated the fluke from sheep in that state. Carbon tetrachlorid has been used successfully for treating sheep, and the airplane has been employed in dusting snail-infested pastures with copper sulfate in order to destroy snails and thus prevent fluke development.
6. Demodectic mange of cattle has been studied, and has been reported as occurring in 15 states.
7. Carbon disulfid has been found to be effective for nasal grubs, *Oestrus ovis* larvae, in sheep.
8. Additional intermediate hosts of poultry tapeworms have been found.
9. Solid carbon disulfid has been found to be not so effective as the liquid form in treating horses for bots.
10. Various studies have been made on susceptibility and resistance to parasitic infections. This is a most fruitful field for investigation.
11. The federal Food and Drugs Administration and the Committee on Proprietary Pharmaceuticals of the American Veterinary Medical Association have made excellent progress against the publication of unwarranted claims by manufacturers of veterinary medical preparations, especially those used to combat parasites.
12. The tick-eradication campaign in the South still continues to progress; its accomplishments are largely unnoticed but nevertheless of great value.

Another accomplishment in parasitology has been the publication of numerous excellent bulletins by the federal government, experiment stations and other research institutions. Radio talks, talks at veterinary, medical and agricultural meetings and elsewhere, all served to instruct and to attract the attention of the public to the importance of the war being waged against parasites.

V. RECOMMENDATIONS

1. Progress in the control of parasitic diseases can be made more rapidly if a knowledge of the epizootology of parasites is available. In some states, records are kept of the parasites encountered from year to year, and it is instructive to note the constant shifts and changes going on in the parasite population.

It would be of great advantage to have such records kept in all states, for then it would be possible for some one agency to summarize the information and thus to supply each state with a parasite "census" for the whole country. Parasites are no respecters of state boundaries.

Such an annual survey, combined with the active application of control measures in those areas most highly infested, would do much toward eradicating parasites.

The question may be raised as to whether the United States Live Stock Sanitary Association is the proper organization to sponsor a parasite survey of the country. That is for the membership and the Executive Committee to decide, and the decision should be made definitely this year.

In order to determine whether the will to coöperate was present, letters were sent, November 17, 1932, to people interested in parasitology in 44 states asking if they would be willing to assist in a nation-wide annual survey of parasites and their control. By November 28, replies were received from 34 states, 34 replies being favorable toward the plan and offering coöperation. These letters will be turned over to the Chairman of the Committee on Parasitic Diseases for 1933.

In view of the above, this Committee recommends that the Association sponsor an annual parasite survey of the United States; that the services of at least one reporter be solicited in each state; that each reporter keep a record of the parasites encountered and send it, together with a report of control measures found effective in his area, to the Chairman of the Committee on Parasitic Diseases not later than October 1 of each year.

2. It is recommended that the Chairman summarize or abstract that data received for presentation at the current annual meeting of the Association.

3. It is recommended that the Association provide expenses for correspondence and stenographic service needed by the Chairman of this Committee.

4. It is recommended that the members of the Committee on Parasitic Diseases be notified of their appointment within a month following the annual meeting.

. . . . Dr. Benbrook moved that the report be adopted, and the motion was duly seconded, put to a vote and carried. . . .

PRESIDENT MALCOLM: At this time Dr. Faulder has some information to give you.

DR. E. T. FAULDER: Members of the Association, it is thirty years next June that I was appointed by the federal government to a minor position on the force of Dr. Dyson, then inspector-in-charge here in Chicago. It is evident that Dr. Dyson has served the federal government for a long term of years in an efficient and thorough manner. There is plenty of evidence that Dr. Dyson has served this Association as Secretary-Treasurer in an equally efficient manner.

As a representative of this Association, it is a great pleasure on my part to extend and present to Dr. Dyson a token of our love and our appreciation of the excellent and thorough manner in which he has acted as Secretary-Treasurer of this Association. This gift is a staple gift. It is something that is selling today above par and something they cannot take from the Doctor.

I present to the Doctor a \$100.00 bond backed by the greatest government in the world, the United States. (Applause)

SECRETARY DYSON: Mr. President and Members of the Association: My limited vocabulary renders it impossible for me to attempt to give vocal expression to my full appreciation of this most generous gift.

This is the first time I have ever had occasion to question the wisdom of any action taken on the part of the Executive Committee. I certainly question it this time, although that does not denote my full appreciation of the gift.

What work I do in connection with the Association is a pleasure. I look forward annually to this meeting. It is the only opportunity I have to meet my old-time friends. I again thank you. (Applause)

PRESIDENT MALCOLM: The next is the report of the Committee on Tick Eradication, by Dr. N. F. Williams, State Veterinarian, Fort Worth, Tex. (Applause)

. . . Dr. Williams read the report. . . .

[REPORT OF COMMITTEE ON TICK ERADICATION

DR. N. F. WILLIAMS, *Chairman*, Fort Worth, Tex.

Dr. C. A. Cary, Auburn, Ala.

Dr. J. V. Knapp, Tallahassee, Fla.

Dr. J. H. Bux, Little Rock, Ark.

Dr. E. P. Flower, Baton Rouge, La.

Dr. C. E. O'Neal, Jackson, Miss.

Your Committee on Tick Eradication is pleased to report that substantial progress has been made during the year in eliminating this disease-carrying pest from the remaining infested areas of the South. This year, 20,290 square miles of southern territory were cleaned up and will be released from federal quarantine by order of the Secretary of Agriculture, effective December 5, 1932. The releases this year affect the following areas:

In Arkansas, the counties of Ashley, Bradley, Calhoun, Chicot, Drew, Ouachita, Union, and the remainder of Desha.

In Florida, the counties of Brevard, Citrus, Indian River, Orange, Seminole, Sumter, the remainder of Lake, and portions of Osceola and Saint Lucie.

In Texas, the counties of Anderson, Austin, Brazos, Burleson, Cherokee, Milam, Panola, Robertson, Rusk, Washington, and the remainder of Fort Bend.

Also during the year 16 counties have been added to the list of released counties reported absolutely tick-free, making a total of 817 of the 884 released counties in which tick eradication is completed.

The release of territory in Arkansas will place all of that State above the tick-quarantine line, thus making it the 12th of the 15 states originally tick-infested to gain freedom from the cattle tick by a systematic eradication campaign. The freeing of an area the size of Arkansas from the cattle tick is an outstanding accomplishment. Only those who have gone through such a campaign can appreciate fully the significance of this achievement or understand the opposition that had to be met and overcome by years of painstaking work and monotonous routine. We congratulate Arkansas for this achievement.

It is also gratifying to your Committee to be able to report that in Louisiana, where this project has been marking time or actually losing ground for the last five or six years, a new start has been made. The Louisiana Legislature this year enacted a law "To Raise Revenue to Eradicate the Tick." This law provides for a tax of 1¼ per cent on sales in the State on such products as butter and butter substitutes, cheese, ice cream, canned milk, beef and veal. The Louisiana law, we believe, is unique in that it is a form of sales tax on products of the dairy and beef industries to finance a live stock sanitary project for the direct benefit of these industries. Arrangements are now under way to resume systematic tick eradication in Louisiana next spring.

UNITED STATES DEPARTMENT OF AGRICULTURE

Bureau of Animal Industry

Washington, D. C.

PROGRESS IN TICK ERADICATION—July 1, 1906, to December 5, 1932.

STATES	COUNTIES QUARANTINED ON JULY 1, 1906	COUNTIES QUARANTINED ON DEC. 5, 1932		COUNTIES RELEASED TO DEC. 5, 1932		AREA QUARANTINED ON JULY 1, 1906 (Sq. Mi.)	AREA QUARANTINED ON DEC. 5, 1932 (Sq. Mi.)	AREA RELEASED TO DEC. 5, 1932 (Sq. Mi.)	
		WHOLE	PART	WHOLE	PART			(Sq. Mi.)	%
Alabama...	67	0	0	67	0	51,279	0	51,279	100
Arkansas...	75	0	0	75	0	52,525	0	52,525	100
California...	15	0	0	15	0	79,924	0	79,924	100
Florida....	67	16	2	49	2	54,861	15,527	39,334	72
Georgia....	158	0	0	158	0	57,438	0	57,438	100
Kentucky...	2	0	0	2	0	841	0	841	100
Louisiana...	64	40	2	22	2	45,409	32,944	12,465	27
Mississippi..	82	0	0	82	0	46,362	0	46,362	100
Missouri....	4	0	0	4	0	1,386	0	1,386	100
No. Carolina	73	0	0	73	0	37,365	0	37,365	100
Oklahoma...	61	0	0	61	0	47,890	0	47,890	100
So. Carolina	46	0	0	46	0	30,495	0	30,495	100
Tennessee...	42	0	0	42	0	16,987	0	16,987	100
Texas.....	198	40	1	157	1	191,885	41,991	149,894	78
Virginia....	31	0	0	31	0	13,918	0	13,918	100
Totals....	985	96	5	884	5	728,565	90,462	638,103	88

Area released December 5, 1932.....20,290 square miles

Area requarantined December 5, 1932..... 0 square miles

(No other areas released or requarantined during the calendar year 1932.)

The annual statement of the Bureau of Animal Industry, recording the progress made in this work to the close of this season, is appended for the records of the Association.

RESOLUTION

WHEREAS, The tick infested areas, in this age of rapid transportation facilities, constitute a serious menace to clean areas, not only of neighboring states, but of all of the states, therefore, be it

Resolved, That the United States Live Stock Sanitary Association request the Bureau of Animal Industry to prohibit cattle, horses, mules and asses from moving interstate from inactive tick infested areas, and be it further

Resolved, That no cattle, horses, mules or asses shall be permitted to move interstate from areas where there are dipping stations and where no active work is being carried on.

... Dr. Williams moved that the report be accepted, and the motion was duly seconded, put to a vote and carried. . . .

PRESIDENT MALCOLM: We are now up to the election of officers. Is the Nominating Committee ready to report?

DR. T. E. ROBINSON: Mr. Chairman, I have been instructed by your Committee to present the following names:

For President: Dr. E. T. Faulder, Albany, N. Y.

For First Vice-President: Dr. J. M. Jones, Nashville, Tenn.

For Second Vice-President: Dr. Walter Wisnicky, Madison, Wis.

For Third Vice-President: Commissioner C. L. Johnson, Hartford, Conn.

. . . It was moved, duly seconded, put to a vote and carried that the By-laws be suspended, and the Secretary of the Association be instructed to cast the vote of the Association for the nominees. The Secretary did so cast the vote. . .

. . . President Malcolm requested that the newly elected officers be conducted to the platform. . .

PRESIDENT MALCOLM: Dr. Faulder, we would like to hear from you.

PRESIDENT-ELECT FAULDER: I deeply appreciate the great honor conferred upon me by this Association in electing me President of this great body. I wish to thank the members of the Nominating Committee and also the members of this Association for their vote of confidence.

Nation-wide benefits have been extended to the live stock industry by the many deliberations of this body. It will be my purpose to continue the methods of my predecessors in promoting the welfare of this Association and extending the many benefits to the live stock industry.

We must finish the great project of tuberculosis eradication started right in this room some sixteen years ago. We must push with vigor the project of Bang's disease and other diseases such as mastitis, Johne's disease and all other diseases affecting domestic animals and humans.

We must also strengthen our organization in the various states. We must also maintain the respect of the live stock interests and the public. I know that, with the usual coöperation of the various committees that work with me, this can be accomplished.

I thank you. (Applause)

PRESIDENT MALCOLM: Dr. Wisnicky, Second Vice-President. (Applause)

SECOND VICE-PRESIDENT WISNICKY: I deeply appreciate this expression of regard which you have given me in selecting me for the vice-presidency of this Association. I will do all in my power to work in the rank for which you have chosen me, and I will be at the disposal and the service of our future President, Dr. Faulder. (Applause)

PRESIDENT MALCOLM: Mr. Johnson, Third Vice-President. (Applause)

THIRD VICE-PRESIDENT JOHNSON: It is with some hesitancy that I accept this great honor for the reason that back in 1928 my predecessor, the Commissioner of Domestic Animals of the state of Connecticut, was so honored, and he never came back. (Laughter)

I surely feel greatly honored to be associated with such men as Dr. Faulder, a man whom we hold in high esteem in the eastern part of our country. I know that regardless of whether he lives in New York State or in the West or the Middle West he will serve the entire country fairly and impartially.

As Third Vice-President I was told by the Nominating Committee that it did not necessarily follow that "just because you are Vice-President you can look forward to being President some day." I think that is a good policy to adopt. It does not necessarily mean that the Vice-President shall be in line for the presidency although it so happened this year that we were fortunate enough to have Dr. Faulder as Vice-

President for two successive years, and he surely is qualified for the office. (Applause)

PRESIDENT MALCOLM: Dr. Cotton is here now and he will report for the Special Committee on Legislation.

DR. C. E. COTTON: Your Special Committee on Legislation, as you know, was established to undertake to get legislation through Congress whereby power would be delegated by Congress to the various states to adopt the necessary laws or rules and regulations to prevent the importation, or to quarantine animals and poultry brought in, so as to protect the interests of the various states.

Dr. William Moore is Chairman of that Committee. Dr. Butler is a member, and I am the third member. The Committee has worked hard. Most of the work has been done by correspondence. I think every regulatory man has been kept in touch with the work as it progressed, or rather the efforts. Dr. Moore has made at least two trips to Washington. Dr. Mohler, Dr. Houck, Dr. Wight, practically all of the professional men connected with the federal Bureau of Animal Industry have extended the utmost assistance.

As was reported last year, this bill was passed by the Senate in two successive sessions of Congress. The bill was introduced in the House and was amended on the first reading by some of the poultry interests. It was introduced in this last session and passed the Senate as introduced by Senator Walsh. It was introduced in the House by Representative Andressen but did not get any further than being referred to the Committee on Agriculture.

We feel that it is very necessary for this work to be continued and, if possible, taken up in the short session that will now convene. If you will allow me, I have a letter from Dr. Moore, the Chairman, that I should like to read.

. . . Dr. Cotton read the letter. . . .

"As previously advised, I made two trips to Washington, as Chairman of the Special Committee on Legislation, in the interest of our resolution providing for the states to issue quarantine against the shipment of live stock into the state. I am enclosing copies of this resolution which was introduced in the Senate by Senator Walsh, of Montana, and in the House by Mr. Andressen. Senator Walsh was successful in having the resolution passed by the Senate, as he has done in the past. I would suggest that the Association again adopt a resolution of thanks to Senator Walsh and Mr. Andressen.

"With the rush of legislation in the last Congress, there being several thousand bills and resolutions, only a few hundred of which passed, and with certain live stock associations of the West against this resolution and with the Texas delegation apparently against it, there was little chance of having this adopted. Unless we can secure the support of the Texas delegation in the next Congress, I feel that it will be impossible to secure this legislation. I wish to state that we had the full support of Dr. John R. Mohler, Chief of the Bureau of Animal Industry, and he gave freely of his time and effort in helping to secure this legislation.

"I understand that the recent New York regulation in regard to abortion disease will be contested in the courts and it seems reasonable to assume that if it is carried to the higher courts that the State of New York will lose, in which case it will further weaken the regulations which we now have. If our legislation was in effect this regulation could be settled without going into court. I think that this is a matter that should be thoroughly considered. I think that we should continue to work for this legislation, but our success will depend largely on the attitude of the Texas delegation and the live stock associations of the West.

"I shall be very glad to assist in any way possible and regret very much that it is not possible for me to meet with you and fully discuss this matter."

WM. MOORE,
State Veterinarian,
Raleigh, N. C.

DR. COTTON: I want to add that in my opinion it does not make any difference as to the outcome of the case that is now in the Court of Appeals in New York. No matter what the decision will be in the New York courts, it will not help matters any. We certainly need this legislation.

I should like to move the acceptance of this report and also that the newly elected President immediately name a Special Committee in order that they can, if they see fit, get busy next Monday with the short session.

. . . The motion was duly seconded, put to a vote and carried. . . .

DR. COTTON: I move that this Association extend a vote of thanks to Senator Walsh, the statesman from Montana, who has so successfully assisted us in this legislation and succeeded in having it enacted three times in the Senate, and also to move a vote of thanks to Representative Andressen for his efforts in at least two successive sessions.

. . . The motion was duly seconded, put to a vote and carried. . . .

DR. COTTON: I might state, gentlemen, that at the session of the Executive Committee of this Association it was moved and carried that \$1,000, or as much thereof as is necessary, be set aside for this Special Committee on Legislation.

According to an Associated Press dispatch, carrying date line of Albany, N. Y., February 13, the United States District Court on that date rendered a decision upholding the embargo on cattle shipped from other states and not meeting the requirements prescribed by the New York State Department of Agriculture and Markets. This particular case involved cattle shipped from Wisconsin unaccompanied by a certificate to the effect that the cattle were from herds free of Bang's disease.

PRESIDENT MALCOLM: We will now hear from Dr. C. E. Cotton, as Chairman of the Committee on Tuberculosis.

. . . Dr. Cotton read the report in two sections. . . .

REPORT OF COMMITTEE ON TUBERCULOSIS

DR. CHAS. E. COTTON, *Chairman*, Saint Paul, Minn.

Dr. L. Van Es, Lincoln, Neb.

Dr. A. E. Wight, Washington, D. C.

Dr. N. F. Williams, Fort Worth,

Dr. E. T. Faulder, Albany, N. Y.

Tex.

Dr. Orlan Hall, Ottawa, Ont., Canada.

Dr. L. M. Hurt, Los Angeles, Calif.

PART I

When the Committee reported a year ago, it was explained that consideration had been given to the advisability of the revision or

rewriting of paragraphs 22 to 26, inclusive, of the Uniform Methods and Rules for the establishment and maintenance of modified accredited areas, for the reason that amendments have been adopted successively since the plan was first adopted. The Committee has considered proposed amendments and revisions and decided they should be furnished to the regulatory officials of the country to study and consider in order that your Committee may be in a better position next year to recommend revision.

PART II

The Committee conferred with representatives of western cattle-growers who presented a plan of determining the incidence of bovine tuberculosis among range cattle. It was gratifying to learn from this group that their organization favors tuberculosis eradication and the ultimate accreditation of range and semi-range territory.

With reference to the methods of procedure the Committee, while cognizant of the problems peculiar to conditions prevailing on the range, also was made to recognize the fact that it could not reconcile the proposed plan with the prevailing opinion of representatives of areas now accredited and to which western feeder cattle are being shipped without more complete information and study of the problem involved.

The Committee further recognizes that difficulties seriously involving the progress of the eradication campaign may arise from the proposed abandonment of the uniform plan now being followed and finds it imperative that this part of the problem also must be studied thoroughly before definite recommendations can be made.

In view of this consideration the Committee recommends that the survey of tuberculosis morbidity in range cattle at slaughtering establishments be continued and extended; that tuberculin tests of herds from which tuberculous animals originated be undertaken with promptness and the federal Bureau of Animal Industry be requested to place the data obtained at the disposal of the Committee.

The committee further recommends that in view of the progress already made in eradication of tuberculosis among range cattle and the cattle of other areas, the present efforts be continued with all vigor and speed.

. . . Dr. Cotton read his report in two sections. Following the reading of the first section, Dr. Cotton moved its adoption. The motion was duly seconded, put to a vote and carried. Following the reading of the second section, Dr. Cotton moved its adoption. The motion was seconded by Dr. Hisel. . . .

DR. W. J. BUTLER: There is one word in the report that we believe should be stricken out and that is the word "abandonment." The word "abandonment" should not be in that report.

The western men desire to offer for your consideration this amendment:

"And it is recommended, however, that range and semi-range cattle of the beef type may be included in modified tuberculosis-free accredited areas, when they are properly identified and postmortem inspection is made, by an official veterinarian, of at least 10 per cent or not less than 25 animals of the breeding herd in any one year, and such postmortem inspection fails to disclose tuberculosis; and provided further that all gathered bulls, all pure-breds, milk cows and barnyard, and what Western men call "the hospital bunch" are tuberculin-tested and found free from tuberculosis, and provided further, if tuberculosis is found in any of the animals of the herd, that the herd shall be tuberculin-tested in accordance with existing regulations."

In order that this may be discussed, I move the adoption of the amendment, Mr. President.

DR. C. G. LAMB: I second the motion.

DR. BUTLER: May I discuss the amendment? We have cattle out on the range during the summer. You cannot test these cattle for tuberculosis any more than you can test them for abortion disease or any other disease. These cattle drift down ordinarily around October or November; in other words, when the snow and winter weather drives them down from the hills. Then they are gathered and placed into pasture. It is only during November and December ordinarily that we can test these range breeding herds. You will realize that that slows up the work tremendously. We can test the other animals; that is, we can test the bulls, we can test the purebred cattle, we can test the hospital bunch, we can test the milk cows and we can test the barnyard cattle any time during the winter. But it is practically out of the question to test the main breeding herd during that period.

What is the difference if you get a postmortem report on that breeding herd, of ten per cent of these cattle, and no tuberculosis is found in them, as against going on tuberculin-testing and not finding any tuberculosis by the tuberculin test?

Under this amendment the stock-grower will have to have the necessary certificates to show that ten per cent of the breeding herd has been shipped to market or has been inspected, has had a postmortem inspection made upon them by an official veterinarian and no tuberculosis found. You are going to speed up the work and you are not lessening the effectiveness of this tuberculosis eradication one iota. It is a perfectly fair proposition, and it will be accepted by the western stockmen at this time, with good grace. I don't see why this may not be accepted by every member of this Association whether he lives in New Hampshire, Connecticut, California, the Middle West or in any of the western states. I therefore trust that you will adopt this amendment.

DR. COTTON: Mr. Chairman, I wish to state that this amendment was presented to the Committee about an hour ago, after the Committee report had been acted on. This is the expression of the Committee:

"It is the sense of this Committee that the amendment proposed after the completion of the report cannot be adequately considered by the Committee and should be placed before the Association."

The Committee did not feel that they were in position at this time, after they completed their report, to give it proper consideration. They felt, in justice to the members, it should be taken to the floor for expression from the full body.

DR. E. L. STAM: I desire to say just a few words in favor of this amendment. If the Committee report as read by Dr. Cotton is adopted, it is my opinion that that will delay the problem of tuberculosis eradication in the West. With the adoption of the amendment as proposed, we will find that the program will be speeded up immensely. We will not have to wait another year to establish a program. This amendment provides for the testing of such cattle as was proposed by Dr. Wisnicky yesterday afternoon. The cattlemen of the West want to work with you gentlemen.

We feel that this Association can make some concession. You will not be endangered by the adoption of such an amendment. You will be protected a year earlier than you would be by the adoption of the original report. It will encourage the cattlemen of the West to feel that they are getting some consideration from you gentlemen in the East.

DR. HISEL: Mr. President, I want to speak against the amendment. My friends, tuberculosis eradication in this country as a national pro-

ject is the greatest thing ever undertaken by any country in the civilized world, and it ought to be completed. It ought to be continued until the last tuberculous animal capable of transmitting that disease through dairy products to any person, is taken care of. Tuberculosis has caused more suffering and taken more human lives than any other disease that we know anything about.

If this amendment is adopted, it will prevent tuberculosis eradication in my state. Consequently, I am opposed to it. We have three counties in Oklahoma which we are now seriously considering for a test, an area test, on the range plan. We believe in this plan, and we believe that it is not a hardship on the owners of large herds.

On this plan we have tested three counties in the panhandle of Oklahoma without a single objection from any stock-owner in that state, after it was understood. The people in those three counties have already received, from the hands of feeders in this country, more money than it cost to eradicate that disease because there are a lot of people in this country who want to feed cattle that are free from this disease.

They tell us that it is an expense to gather these cattle and test them on the area plan, and we grant that it is. There is little that man does that does not create expense, as far as that is concerned. What about going into a dairy herd that is in the peak of production and jostling them around and testing every individual in that herd? What about the loss and what about the cost to the dairyman? Certainly it would hurt a dairy cow more than it would a range cow that is used to taking the bumps as she goes along.

I don't think this amendment ought to be adopted for the reason that the federal government has spent more than \$50,000,000 on this project. Almost fifty per cent of the counties in the United States are free, or comparatively free, from this disease. By the time the counties are completed, that we are now working, more than 50 per cent of this country will have undertaken, in a systematic way, the eradication of this disease, which will be a blessing to mankind.

I don't think this report ought to be adopted, because the gentlemen who come here today (and we feel kindly toward them in every sense of the word) ask us to amend and to do this for their special privilege, and I don't believe in special privileges to anybody. I believe that we were all created equal, and that we should not mete out special privileges to any class. How many does this involve? How many people does this involve in this nation? It would be my guess (I don't know, but just making a guess) that this would not involve 100 cattle-breeders in this country. Think of setting aside the balance of the nation. I am talking about big operators. That is a good joke to the boys over here, but, listen, I am talking about big operators. They spent lots of time telling us about these fellows who have 2,000, 5,000 and 10,000 head of cattle, and even bigger. Those are the fellows I am talking about right now. I don't believe that this is going to hurt those people in any sense of the word. I believe we ought to continue as we have been going, and soon we will see the end; in fact, we see the end now. Idaho is free from tuberculosis. They have tested their cattle. Why not Wyoming and why not Colorado and why not these other states that have done nothing? They have made no effort. If they had gone out and tested cattle on the range plan and had come back and said, "We don't find this practical," and could show us some concrete evidence as to why these cattle could not be gathered on the 10 per cent basis, then we might be in a position to listen a little bit, but I don't believe that they come with a fair deal. After eight states in this Union have completely eradicated tuberculosis, then they come to you people who have spent your money to eradicate tuberculosis in

the various states, in the Corn Belt particularly, and say that it does not make any difference. "You accept our feeder cattle. They are free from tuberculosis." If they are, let us prove it to the world. Let us test the cattle and prove it to the world that they are. I admit that the incidence of tuberculosis in range cattle is very, very low; there is no question about that. We tested Cimarron County, Oklahoma, and found four reactors. True, we tested Texas County and found seventy-eight. We tested Beaver County and found fifty-eight. Many of them had single points of infection. We are told that tuberculosis doubles itself in a herd every three years. If that is true, then we had better be getting those points of infection out of the herd.

MR. H. R. SMITH: I am afraid Dr. Hisel does not understand the situation. This is no concession at all. All of us are in favor of tuberculosis eradication. I have been working on this for fifteen years. I know something of the conditions of the range country. I know what they are up against out there. If we can save them a little work, at the same time making this safe, I say go ahead and adopt this amendment. I believe that can be done. There is no concession. You are simply taking a postmortem report on the 10 per cent of that breeding herd out in the pasture. All other cattle are tested, milk cows, bulls and everything else.

It is just a question of this: Can we safely take the postmortem report or isn't it safe, as compared to the test? I maintain it is safe, and I maintain that if you test all these other cattle and get a postmortem report on the 10 per cent of the breeding herd, it is absolutely safe and you are making no concession whatever. Let us be fair with this. Let us be reasonable. Let us have a clear understanding of the whole situation; that is all I have to say. I think it is perfectly safe to accept the postmortem report on 10 per cent of the breeding herd. It does not interrupt the plan in any case whatever. The work goes on and will go on a great deal faster. You will get the coöperation of the range men and proceed to get the country cleaned up a great deal quicker under this plan. It is just a matter of two alternatives.

DR. N. F. WILLIAMS: Since 1928, I, with other representatives of the western states, bitterly opposed plans that were offered for those states to follow. Each year Dr. Butler was a leader. We were able to prevent the adoption of plans that were extreme and that the range states could not follow.

Last year a compromise was affected. We of the western states were satisfied with that compromise. We believed that those boys went to the extreme limits of safety. I was a member of that committee looking for further concessions, that would give us some time to get our machinery in operation. We cannot operate in the range country as rapidly as you can in the dairy herds. We have to have time. After signing that report I came on the floor of your last convention and at the eleventh hour offered the amendment that put this testing off until 1934. That saved the situation at that time and was satisfactory to all of the representatives who were here at that time. I took that message home to my people, many of whom realized that as a result of the gigantic clean-up operation across these whole United States a great preferential market was developing, and if they were to participate in the benefits of that market in the future, they must establish the product that that market required. Those men were not forced to test their herds. They were not forced to comply with this compromise that we made here in good faith and a compromise that I have made an earnest effort to honor and to live up to.

We have accredited some counties in Texas. We would have accredited more were it not for some opposition that I feel should not have existed. I would have felt better if I could come to you today

and say there was no opposition, that we had conducted so many tests. "Here are the results of what we have done. On that basis can you grant us any further concessions?" Unfortunately, I cannot do that.

I want to answer another statement of Mr. Smith, and I want this to be understood by everybody: There is no test for tuberculosis but the tuberculin test. (Applause) There is no other way to determine tuberculosis than that. We say this postmortem procedure does have some value. It is a valuable auxiliary. If those men who do not want to test will cooperate with those who are conducting those tests, they will be working to the same end that we are working toward, and then perhaps we can come back with their work and my work and convince you that what they are telling you today are really facts.

Dr. Hisel touched on the public-health part of this program, and that is a serious problem. We must bear in mind that as long as there is a center of infection anywhere, tuberculosis eradication among the human race will never be achieved.

I want you gentlemen to consider the welfare of your herds. I am considering the welfare of those men at home who have established their herds and have them ready for those markets, those preferential markets. I am pleased to say that some of those men have already benefited. I am sorry, however, to say that a buyer who was sent to my office from one of the northern states went across into the Oklahoma strip, into Dr. Hisel's territory, and bought cattle there because my counties were not advanced far enough for him to take his loads from there.

Three of our large ranches are now preparing to take on that work. One of those ranches asked us to do that two years ago, when we were unprepared to do it. The owners ship widely all over the United States and they have one of the best organized cattle ranches in the United States and have a national reputation. They are business men who realize that to save their market they must stamp the goods and prepare the goods to suit the specification of the buyer. I want to make myself clear on that because I owe an obligation to those men who are at home satisfied, as well as to those objectors who are here today, who, however, I am pleased to believe, are honest in what they are saying.

I hope this amendment will not carry. (Applause)

DR. W. T. SPENCER: I favor this amendment. I think one of the most important things in this program of tuberculosis eradication has been cooperation. That has been the thing that has put it over and has brought it to the stage where we are now.

These gentlemen have come down here with a program that has not been practical. The program they submitted at first was not practical and not acceptable. But they present an amendment now, through Dr. Butler, an old-time member of this Association, one in whom all of us believe and have confidence. Dr. Butler has a first-hand knowledge of this problem that we are discussing, and he has presented an amendment here that is workable and practicable and will find the tuberculous herds in the range territory. I for one am favorable to it. I hope that we can adopt this amendment and go forward with this tuberculosis-eradication program in that section of our country within the next year or two, which will be delayed if the amendment is not adopted, because these men feel that they have given us a concession. I think in the majority of cases this plan that they are proposing will test as many cattle and locate more centers of infection than the plan that was proposed last year. I don't know whether you all got it, but there is a minimum on that amendment, that there must be at least twenty-five cows from the range herds sent in under this plan for postmortem report. That means that the herd must consist of 250

cattle. That will take in, by far, the large majority of range and semi-range herds. In our state there will not be many herds with more than 250 cows. I think this is entirely fair, and I think it is safe and practical and should be adopted.

MR. F. E. MOLLIN: I just want to say this: I attended a meeting, a few weeks ago, at Marfa, Texas, of the Executive Committee of the Texas and Southwestern Cattle Raisers Association. There was not a dissenting voice there against the resolution which was adopted urging the adoption of the packing-house study as a means of accreditation. I know that a similar meeting was held (it wasn't a full meeting) at Amarillo in the early spring, attended by Mr. Spiller who, unfortunately, cannot be here, and other members of the Executive Committee in that section. They adopted a similar resolution. I further know that a great deal of the testing that has been done in the last year or two in the range areas has been done under the impression that we had to do it. It has not been entered into voluntarily by the western men, or in the belief that their herds needed it particularly, but they have been told that they were going to have to submit to that resolution or they could not move their feeder cattle interstate. That has been the selling talk on a lot of this work that has been done.

It was our hope, when we came down here, that you would make a concession of the kind that is now offered so that we could go back home and get behind this thing and push it. I am sure that every one of these gentlemen has told you this would expedite the work, and has told you truly. There will be a sincere effort on the part of the West to get behind this plan. There will be a lot more progress made in the coming year with the money that will be available than would be possible under the present plan of just starting in to test cattle whether they have to or not. The plan we propose centers the work on the places where the packing-house report reveals infection. I assume that that is really what you are after. Eventually we are going to get the entire job done and get it done a lot more quickly than would be possible under the other plan.

DR. F. H. BROWN: It seems to me that the question as to whether the amendment should be adopted should be weighed with a whole lot of thought. What I want to know is: How much was it weighed in the Committee? When did this motion come to the Committee?

We have been talking about this thing of getting our feeder states accredited. I don't like this eleventh hour proposition of amending the regulation. Neither do I favor the adoption of a motion which a committee, after two days of discussion, cannot agree upon. I don't feel equal to the occasion of passing upon it within thirty minutes of the time that I have to leave to catch my train.

If this amendment had been brought to the attention of the body yesterday and been thought over during the night, it would have been our responsibility as a committee of the whole to pass upon this as to whether the amendment should be adopted. I would be glad to have had that opportunity of thinking it over. I don't want to deprive these western men of anything that should be granted. I would not vote against any motion that would give them a privilege they should have in connection with this work, but there has been too much delay. I believe, in getting our western states on this national program of bovine tuberculosis eradication.

I just cannot support the amendment offered to the Committee's report, as I do not think this group has had ample time to study it.

PRESIDENT MALCOLM: Can you answer the question as to whether the amendment was before the Committee?

DR. COTTON: In justice to the Committee I should like to explain that as Chairman of the Committee on Tuberculosis it devolved upon me to do all of the preliminary work and the preparation of the program for the session on tuberculosis, as you know has been done in the past.

In October, Mr. Mollin, the Secretary of the American National, wrote a letter to our President. It was referred to me as Chairman of the Committee. In that letter he stated that members of his organization, other western cattlemen, would like to appear on the program and submit some suggested changes relative to the requirements of our present plan which requires that 10 per cent of the range cattle shall be tested. I immediately wrote and told him that I did not have time to confer with the members of the Committee but as there was a question about two papers we were endeavoring to obtain I would take it upon myself, without communicating with the other members, to assure him we would be glad to give him the privilege of the floor, with the understanding that his paper would be submitted to the men whom we would ask to discuss it; we would ask two men to discuss it, and we would allow him to name the man who was to follow in the discussion. That was acceptable. Dr. Brown was presented with a copy of the paper that Mr. Mollin sent to me as Secretary, and it was read to you yesterday afternoon.

After his paper was read, in fact at the first session of our Committee, this group met with the Committee. This hearing lasted all of yesterday forenoon. At that time they presented this proposition, and this is the proposition that has been considered by the Committee:

"In lieu of Section 27, Modified Accredited Area Plan, sub-heading 'Range and Semi-Range Cattle': That all range and semi-range cattle in the range and semi-range areas be accredited when the postmortem reports of the various packing establishments under federal supervision reveal the percentage of tuberculosis to be less than one-half of one per cent, provided that the sanitary officials of the range and semi-range areas agree to tuberculin test all herds in which tuberculosis was found upon postmortem examination.

"Sub-heading 'Areas': Areas in the range and semi-range districts may be accredited when all milk cows, pure-bred breeding cattle and barnyard cattle are tuberculin tested, and the percentage of tuberculosis among such cattle and among the range and semi-range cattle in said areas, as evidenced by the postmortem findings, is reduced to less than one-half of one per cent."

That, gentlemen, was the proposition the Committee had to consider. The Committee certainly gave it very serious consideration, and for many hours. There was a question of the border-line between the so-called semi-range and range and the farmers' herds as to how they could go on and function under this plan. Some would be satisfied; others would not. There might be a large range or a large farm and farther west there would be a small farm. The function of the official is to make the distinction on that border-line and how that border-line could be sustained or even named.

The matter of 31 states that have already spent large sums of money was brought out on the floor. Our Committee had a meeting this afternoon after the final report was drafted, and it was signed unanimously. We came here prepared to make the report. You will recall we asked you to recess for the reason that these gentlemen, with Dr. Butler representing them, whom we all respect for his seriousness and his long period of membership, prepared another proposition to present to the Committee and brought it to me as Chairman. I stated that I was in no position to answer it and called the Committee together. The

Committee hurriedly gave it a hearing and some discussion, and it was of the opinion it could not do anything and it should be passed on to the floor. If you will allow me, I will read it again:

"It is the sense of this Committee that the amendment proposed after the completion of the report cannot be adequately considered by the Committee and should be placed before the Association."

DR. BUTLER: You asked, Dr. Brown, how long has this been before this Committee of the Association. Exactly eight years. I read a paper here in 1924 in which I advocated an amendment somewhat similar to this. It has not been applicable up to the present time, that is until now, when the United States Bureau of Animal Industry has established a system of following up the identification of animals at the packing-house. Any one of you who desires to read the report of the 1924 meeting of this Association will find that I made a statement similar to the amendment.

With reference to the original amendment offered by the other gentlemen, I could not quite go the full way with them, and I told them so. They understand my position. I did not want to interfere with it, and let them discuss it. Inasmuch as the Committee on Tuberculosis did not feel like adopting their amendment, I proposed this amendment. That is why it has been presented at this particular time. There is nothing underhanded about it. I advocated this in 1924. Don't think that Montana has not been tuberculin-testing. North Dakota, Minnesota and Montana started this tuberculosis work. Look up the record.

The first place the area plan was ever conducted was in the state of Montana in 1916. If there was an area plan before 1916, then I will have to take that back, but I do not know of any place where any work was carried on previous to 1916. You will remember that Montana advocated the intradermic test. Our distinguished friend stated that never, so long as he lived, would a cow come into the state of Minnesota if it were subjected to the intradermic test.

Our duty as veterinarians is to eradicate disease, not a "plan." I hate that term "plan." We just become a lot of automatons when we say we have to follow a plan. It is the law of the State of Montana, and has been since 1911, that all dairy cows in the State would have to be tuberculin-tested annually, and we have carried it out up to this date. I don't say we test every milk cow in the state but we test practically every milk cow whose milk is going for public consumption. We test all of the dairy herds. The entire dairy inspection is under the veterinarians of the State. We inspect the dairies. We draw up the regulations. We draw up the rules and the standards of production, standards of milk, cream, and all of it.

Under this plan you are going to help the men of the West. We are not like Texas; we have winter. Sometimes we like it; sometimes we don't. Nevertheless, we have winter. You cannot go into a big man's breeding herd, maybe thousands of acres, hundreds of acres or five hundred acres, and mill around a lot of breeding cows in the middle of winter.

As I told you, our time is limited to about two months when we can do the testing. Under this plan we are going to test the dairy cows, we are going to test the hospital bunch, we are going to test the bulls, we are going to test the pure-breds and we are going to test the barnyard cattle. If there is any tuberculosis found, the entire herd must be tested. In addition, if in this breeding herd any tuberculosis is found on postmortem examination, we are going to test the entire herd.

Dr. Williams says there is only one test for tuberculosis and that is

the tuberculin test. In the main he is right; that is the test we use. But do you mean to tell me that you are going to find tuberculosis in a breeding herd and not find macroscopic lesions? If you tuberculin-test the hospital bunch, all of the bulls and all of the other cattle and do not get a reactor, it is inconceivable. You will soon get a reactor in this hospital bunch. You will get a reactor in some of the cows, if it is in the herd. The only thing we are asking you men to do is to help push this work along. We are not going to sell you diseased cattle; we don't want to sell you diseased cattle. You would think we were opposed to the eradication of tuberculosis; we are not; we are for the eradication of tuberculosis or any disease, but we want that to be carried out under the most practical plan that you can devise.

Again, if we get a postmortem report, we will not simply tuberculin-test a part of that man's herd, but we will tuberculin-test the bulls, the hospital bunch, the barnyard cattle, the pure-bred cattle and the milk cows.

This is not a concession to these stockmen. This is not for any privileged class. This is to help the veterinarian. Do you know that we have to keep the tuberculin next to our skin to keep it from freezing, lots of times? That is all right. We can tuberculin-test the dairy bunch and the barnyard bunch any time of the year. Instead of working in November and December, we can work over the entire year.

This is not in any way a concession to a privileged class but it is just good, common, ordinary sense for the eradication of tuberculosis. (Applause)

DR. C. H. HAYS: I do not rise for discussion, I rise for a point of clarity. As I understand the amendment, it is to handle a certain, individual herd situation. It does not alter the recommendation, if adopted, of the Committee's report. The report, as I understand it, is primarily directed to the question of accreditation of an area. This amendment does not affect accreditation, it is to take care of an individual herd proposition.

DR. BUTLER: That is correct.

DR. COTTON: If you will allow me, it certainly does change the present plan. The present plan for the accreditation of an area provides that 10 per cent of the cattle shall be tested. This must necessarily amend that plan. They propose to amend by cutting out the word "abandonment" and then adopt their amendment.

MR. MOLLIN: I should like to tell you how we understand it, and that is just simply this: As you establish area work in the range country and you come into Mr. Brock's area, you are going to test all the cattle around the place, the bulls and the dairy cows, if he has any, and the barnyard cattle. Then you are going to test 10 per cent of his breeding cows. If he cannot furnish you with a record of having shipped 10 per cent of those breeding cows, he is going to have to submit 10 per cent of his breeding herd to the test. That is our understanding of it.

DR. T. E. MUNCE: I am very sorry I am not a capable enough public speaker to enter into this oratorical contest which has been going on here between the representatives from the western states.

Every year since about 1918 there have been presentations made on this floor to modify, to curtail, to ease up the different phases of the work on tuberculosis. Some of the speeches which we have heard today we have heard every year, practically the same thing. One of the speakers has been a very consistent advocate of the tuberculin test. Today he comes here blindfolded and makes the final plunge for the abandonment of the tuberculin test and to substitute autopsies, the very thing that Dr. Brown pointed out yesterday.

We are an importing state. I have been talking to others who import large numbers of cattle which these people claim they have to sell. We are absolutely going to refuse to take your cattle if you abandon the tuberculin test and if this amendment goes through. If you want to sell your cattle, my suggestion is that you wrap up your goods in packages that we will take.

Therefore, I certainly hope you vote down this amendment and support the regularly organized Committee of this Association. (Applause)

DR. BUTLER: This is just a matter of privilege. Dr. Munce was talking about me. I most emphatically want to state that I am not opposed to the tuberculin test, and I am not abandoning the tuberculin test. I am as strong an advocate of the tuberculin test as any man in this room. It is not in any sense of abandoning it one iota. I just did not like that statement.

. . . The question was called for . . .

PRESIDENT MALCOLM: Gentlemen, are you ready for the question? The question before the house now is whether you adopt the amendment to the Committee's report, which was introduced by Dr. Butler on the floor of the house. All in favor of the amendment will signify by saying "Aye"; contrary, the same sign. That is a little too close for me to decide, therefore I will put the question again. All the members of the Association who are in favor of adopting the amendment of Dr. Butler will please rise. (Nine) All those opposed to the amendment and who are members of the Association will please rise. (Seventeen) Seventeen oppose and nine are in favor, so the amendment is lost.

DR. BROWN: May I have the floor for just a minute? I want to make a suggestion. First I want to say that my vote against this motion does not mean that I do not favor checking through the packing-house, but I repeat it is because this thing came to the Association at this hour. I have absolute confidence in Dr. Butler and these other men who favor that motion, but I have been fooled too many times on an eleven-hour procedure. This may not be what I think it is. If it is what I hope it is, I think I am for it.

I would suggest that these men go back home and follow these field tests and come back here next year with a more definite program and more results. If I live that long and am here, if there is reported all the information I should like to see brought before this Association, I should like to see it acted upon.

PRESIDENT MALCOLM: The amendment is taken care of. Now we will vote on the original motion, which has been seconded, that we adopt the report of the Committee on Tuberculosis. All in favor of that will please rise; those opposed will please rise. The motion is carried.

Gentlemen, before presenting your new President I want to say this before leaving you: I want to thank you for the hearty coöperation you gave me in conducting this meeting. I now present to you, Dr. Faulder. (Applause)

. . . President Faulder assumed the chair. . . .

DR. N. F. WILLIAMS: Mr. President, I move that a vote of thanks be given to the retiring officers.

. . . The motion was regularly seconded, was put to a vote and carried. . . .

PRESIDENT FAULDER: I now declare the meeting closed.

. . . The meeting adjourned at 5 p. m. . . .

ADJOURNMENT

APPENDIX

FINANCIAL STATEMENT

O. E. DYSON, *Secretary-Treasurer*

RECEIPTS

Membership dues	
312 @ \$2.00.....	\$ 624.00
State memberships	
35 (see list) @ \$25.00..	875.00
Reports sold	
U. S. B. A. I.	\$77.24
Canada Dept. Agr.	50.00
Penn. B. A. I.	25.00
Miscellaneous	6.68
	158.92
Interest on U. S. Bonds and	
Treasury Certificates ..	166.84
Total Receipts	\$1,824.76
1931 Cash Balance (less	
prepaid memberships)..	1,028.43
	\$2,853.19

DISBURSEMENTS

10 \$100 Bonds purchased..	\$ 959.47
Printing 1931 reports....	452.50
Reporting meeting	161.23
Clerical hire.....	30.00
Printing and Stationery..	75.95
Postage	83.97
Rebated memberships....	4.00
Tuberculosis Committee..	171.70
Abortion Committee.....	4.30
Legislative Committee	
(Special)	72.48
Poultry Disease Com-	
mittee	117.82
Sundry expenses.....	12.13
Exchange (Canada).....	6.48
Total	\$2,152.03
Cash balance, December 1,	
1932	701.16
	\$2,853.19

CURRENT ASSETS—U. S. Treasury Certificates.....	\$2,300.00
U. S. Bonds.....	2,500.00
Cash balance in bank.....	701.16
	\$5,501.16

LIABILITIES—None.

STATE MEMBERSHIPS

Alabama	Kansas	Nevada	Rhode Island
California	Kentucky	New Hampshire	South Carolina
Colorado	Maryland	New Jersey	Texas
Connecticut	Massachusetts	New York	Utah
Florida	Michigan	North Carolina	Vermont
Georgia	Minnesota	North Dakota	Virginia
Illinois	Mississippi	Ohio	Wisconsin
Indiana	Montana	Oklahoma	Wyoming
Iowa	Nebraska	Pennsylvania	

Total—35

U. S. Bureau of Animal Industry
Canada Department of Agriculture

December 1, 1932.



Regular Army

Major Seth C. Dildine is relieved from further assignment and duty as a student at the Army Veterinary School, Army Medical Center, Washington, D. C., effective upon completion of his present course of instruction, and will then report for duty in the office of the Surgeon General, Washington, D. C.

Major Charles S. Williams is relieved from his present assignment and duties as a student at the Army Veterinary School, Army Medical Center, Washington, D. C., effective upon completion of his present course of instruction, and will then report for duty at Fort Knox, Ky.

The following-named officers are relieved from further assignment and duty at the Army Veterinary School, Army Medical Center, Washington, D. C., and from temporary duty at the Medical Field Service School, Carlisle Barracks, Pa., effective upon completion of their present course of instruction, on or about June 1, 1933, and will then proceed to the stations specified for duty: 2d Lt. Russell McNellis, Ft. Oglethorpe, Ga.; 2d Lt. Wesley W. Bertz, Port of Embarkation, Brooklyn, N. Y.

Veterinary Reserve Corps

New Acceptances

Slatter, Ervin Edwin....2nd Lt... Animal Pathology Laboratory, University of Ill., Urbana, Ill.

Promotions

To

Gallahue, Thos. Patrick.Capt....1314 Ash St., Waukegan, Ill.
Magens, Hans Jeurgen..Capt....P. O. Box 1114, Huron, So. Dak.
Shipley, Michael.....Capt....P. O. Box 311, Phoenix, Ariz.
Hoon, Henry Ross.....1st Lt...6234 N. Montana Ave., Portland, Ore.

Wins Hoskins Memorial Medal

Second Lieutenant Russell McNellis, V. C., was awarded the Hoskins Medal for the year 1932-1933, at the graduation exercises of the Army Medical Schools, Army Medical Center, Washington, D. C., January 27, 1933.

The following members of the Veterinary Corps were among the graduates: Majors Seth C. Dildine and Charles S. Williams; Second Lieutenants Wesley W. Bertz and Russell McNellis.

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